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CLINICAL MANUAL FOR THE STUDY OF DISEASES OF THE THROAT.

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MDCCCXCIV.

FIG. I. As seen in the mirror during the emission of a high note.

FIG. II. As seen during quiet respiration.

FIG. III. As seen during deep inspiration, showing the anterior wall of the trachea, and the division of the trachea into right and left bronchus.

CLINICAL MANUAL

FOR THE STUDY OF

DISEASES OF THE THROAT

BY

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JAMES MACLEHOSE AND SONS

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PREFACE.

THIS manual, dictated in great part by personal experience, is intended for the use of students and practitioners desirous of becoming acquainted with the diseases affecting the fauces, the pharynx, and the larynx, and with the means employed in their treatment.

The book is divided into two sections. In the first, the systematic examination of the parts is discussed, and the various manifestations of disease, which may be met in connection with the different structures, are described. In the second and larger section, individual diseases are considered in detail, according to their importance and the frequency of their occurrence; and the necessary medicinal and surgical treatment is discussed.

The necessity for such a guide has long been felt by me in my capacity as a teacher in this department, and I trust it may be of service to others similarly engaged.

I have pleasure in here recording my thanks to Dr. M. Mackintosh of Lavender Hill, Clapham, for his assistance in the revision of the text, both in manuscript and in proof.

The illustrations, except Figs. 2 and 6 and those representing instruments, are original, and from drawings by the author.

J. W. D.

4 WOODSIDE CRESCENT,
GLASGOW, *March*, 1894.

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PRELIMINARIES.

THE symptoms complained of by a patient suffering from any affection of the throat may vary greatly; but whatever they are, the examination of the parts should be thorough and systematic. In order that no evidence of disease which might throw light on the cause of the complaint be overlooked, the mouth should as a preliminary be examined in all cases, and in many the condition of the nasal cavity should also be ascertained.

Before making an examination inquiries are necessary to elucidate facts concerning the patient's condition, and in making notes of the case regard should be had to orderliness. The completeness of the story is thus ensured, and details are, on reference to the case, more readily grasped. The **name** is ascertained for purposes of identity, and for future reference; the **age** is noted for similar reasons, and also because it is occasionally of importance as an aid to differentiation in doubtful conditions; and **occupation** is inquired into. A knowledge of the occupation is sometimes of the first importance, giving in many cases an indication of the probable cause, and in some cases it may be the exciting cause,

of the diseased condition. As examples, the case of workmen who are exposed daily to the fumes of irritating gases, or whose occupation involves the continuous respiration of air loaded with solid particles, *e.g.*, coal dust, may be mentioned. The patient's account of his symptoms is then obtained, in the order of their appearance, and the supposed cause, if possible, inquired into. In thus taking the patient's history attention must be carefully confined to facts, as the opinions expressed by patients are frequently suppositious, and often erroneous. When, for purposes of eliciting exact information, a question is put, it should be simple, clear, and readily comprehended, so that an intelligent reply may be given. Special note should be made of symptoms referable to any particular locality, and, as in general "case-taking," family history should be inquired into, with more or less detail according to the condition under investigation.

Means of Examination.—This concluded, examination of the parts should be proceeded with. Though the sense of sight is of the first importance, great assistance is rendered by other three of the special senses, when educated for this purpose, and these should be habitually employed.

(*a*) By the sense of **smell,** changes in the odour of the breath are detected. For example, there is the characteristic odour arising from the presence of carious teeth ; the very disagreeable odour of ozoena ; the mercurial breath, and the smell of alcohol. This latter is both common and important, and its detection may be useful in directing attention to the cause of faucial and pharyngeal congestions which otherwise might be puzzling.

(*b*) By the sense of **hearing,** changes in speech, in the voice, and in the breath-sounds are detected. Enlargement of the tonsils, cleft palate, and perforation of the palate, occurring as a congenital malformation or as the result of

disease; paralysis of the palate, a not uncommon sequela of diphtheria, and paralysis of the tongue as met with in glosso-labio-laryngeal paralysis, each produces a characteristic change in the speech. The voice may be modified in a variety of ways, or even abolished by many and widely-differing laryngeal conditions. The breath-sounds, again, may have more or less of a snoring character where obstruction exists in the buccal or nasal cavities; and where the obstruction is laryngeal the shrill note produced by the strained breathing at once arrests attention.

(*c*) **Touch** is employed in the detection of fluctuation, of tenderness, and in determining the degree of resistance of a part, as in differentiating between a simple and a malignant ulcer. Touch in pre-laryngoscopic times was successfully employed in diagnosing several laryngeal conditions, examples of which are recorded by Professor Gairdner in his *Clinical Medicine* (Edinburgh, 1862); and at present, touch is of the first importance in the examination of the pharyngo-nasal space and the posterior nares.

(*d*) Examination by the sense of **sight** is next proceeded with, and although in many cases little time need be spent in viewing many of the parts about to be enumerated, it is wise in all cases to look at them at least, in order that no point which might assist in arriving at a correct diagnosis be overlooked.

THE MOUTH.

First the **lips** are examined. These may be pale, as in general anaemia, arising from many causes, or they may be livid or cyanotic from interference with respiration, or from some cardiac condition. Again, where the patient's temperature is febrile, the lips may be dry and possibly coated with sordes, which consist of an accumulation of mucus and saliva, with particles of food, dried,

crusted, and firmly adherent to the parched mucous membrane. In children a naevus may be met with on either lip, causing it to be prominent and discoloured at the part affected. A vesicular eruption—*herpes febrilis* or *labialis*—may occasionally be observed. It is always symptomatic of some internal disorder, and is met with in its most characteristic form as a symptom of acute lobar pneumonia. In many persons herpes of the lips or face appears during the currency of an acute catarrh, or it may follow a rigor, especially when associated with irritation of a mucous tract. The vesicles, usually few in number, are of large size; they remain separate, their clear contents

FIG. 1.—Hard chancre of five weeks' duration on lip in a girl aged 13. (From a photograph by Dr. Kennedy.)

rapidly become turbid, and they dry up into scabs, which are soon thrown off, and all trace of them is lost within a short time. Around the lips, and especially in the skin near the angles of the mouth, may be seen radiating white

lines, suspicious of inherited syphilis. The mucous membrane at the junction of the upper and lower lips may be hacked or fissured as a result of inherited or acquired syphilis, and on the inner or buccal surface mucous patches are frequently to be found in those suffering from the same disease. Somewhat similar patches are said to result from irritation of the surface by dirt and moist secretions, when of course their existence is unaccompanied by other evidences of syphilis. In hospital practice epithelioma of the lower lip is not uncommon, and the possibility of a primary syphilitic lesion—a hard chancre—on either lip should be borne in mind.

The general contour of the lips may be altered, and their movements interfered with, in certain paralytic conditions. The most common illustration is that met with in facial paralysis, and in cases of hemiplegia implicating the facial muscles, where the angle of the mouth is lowered on the paralysed side, which becomes more apparent when the patient smiles. In myxoedema, again, the lips are thick and prominent, and the movements clumsy and difficult. Contraction of the lips may be met with as a result of burns, syphilitic ulceration, or cancrum oris, and in such cases the presence of cicatrices bears evidence to the destructive nature of the lesion.

Next in order the teeth should be inspected. Mr. Jonathan Hutchinson has drawn attention to a malformation of the permanent teeth associated with hereditary

FIG. 2.—Upper central incisors of the permanent set (after Hutchinson).

syphilis. In a typical case the upper central incisors are stunted both in length and breadth, peg-shaped, and each

bears a crescentic notch at its free margin, due to want of development of the middle denticle. The lower incisors in such patients have frequently a worm-eaten or honeycombed appearance, a condition described by dentists as "rocky" enamel, which, however, is not distinctive of the syphilitic taint, as a similar appearance may be brought about by the occurrence of any severe illness during dentition. It is also found in those the subjects of rachitis. Teeth more or less destroyed by caries not infrequently produce irritation, which spreads to the fauces, and a badly fitting denture may occasionally be found to be the source of a patient's discomfort.

An examination of the **gums** is equally important. Like the lips, they may be pale or livid, and from similar causes. When the teeth are in an unhealthy condition the outline of the gums is often irregular, and the surface spongy and at parts eroded. Sponginess of the gums, along with submucous haemorrhages, are associated with both purpura and scurvy; and a somewhat similar condition may be found, along with marked foetor of the breath, where the administration of mercury has been 'pushed.' The blue line along the edge of the gum indicative of lead poisoning, and the red line associated with delicacy of constitution—though not necessarily phthisical, as held by some—should not be overlooked. The gum surrounding a carious tooth may be inflamed, swollen, and tender, the inflammation resulting in a superficial alveolar abscess or gum-boil; or the inflammatory process may be more deeply seated as the result of acute dental periostitis, when pus forms around the fang of the tooth. In this maxillary, or deep alveolar abscess, the gum is greatly swollen, the cheek is also red, swollen, and tender, and the lower jaw becomes fixed by inflammatory deposit. Pus may be seen to well up along the side of the tooth, but when it cannot find a

way of escape in this direction it will, by burrowing, separate up the periosteum from the bone and lead to necrosis of a portion of the jaw.

During the examination of the gums an epulis may be discovered. This is a small, rounded, or irregularly shaped growth covered with mucous membrane. It springs from the alveolar process and periosteum of either jaw, though it is most commonly met in connection with the lower jaw, and as it increases in size it displaces the teeth. In some cases it appears to be of the nature of a simple fibrous tumour, though usually its structure is that of a round-celled sarcoma.

The mucous membrane lining the **cheeks** is next examined. It may be found to be injected generally, as during the course of a common cold, or the area of injection may be circumscribed when it results from some local irritant, as a jagged tooth. The opening of Stenson's duct, the excretory duct of the parotid gland, is readily seen by separating the cheek from the jaw. It perforates the lining membrane of the cheek obliquely opposite the second molar tooth of the upper jaw. Mucous patches may be met with on any part of this lining mucous membrane, though their site is usually determined by some local irritant, and they are frequently found at a part which lies in contact with a foul or broken tooth. These patches are similar in appearance to mucous tubercles found elsewhere—serpiginous in outline, slightly elevated, with a flat, dirty-white surface. They are altogether different in appearance, as in nature, from aphthous ulcers, which are often met with in poorly-fed or carelessly-fed children, and in adults far spent by some exhausting disease. Thrush (*Fr. muguet*) appears as small, whitish, slightly-elevated spots, often present in considerable numbers, and resembling particles of curd, for which they are apt to

be mistaken. If the white patch is removed, the surface beneath is usually found to be excoriated. The white coating is composed of cast-off epithelial cells, held together by the threads of a fungus—the *oidium albicans*—which latter, if treated with *liquor potassae*, is readily demonstrated under the microscope. The reaction of the surface on which this growth flourishes is acid.

Cancrum oris, which is usually an inflammatory affection of the cheek, though it sometimes affects the lips, the gums, and even the jaws, is met with comparatively rarely. It occurs as a rule after measles, chicken-pox, and scarlet fever, in weakly, badly cared-for children, whose surroundings are unhealthy, and it rapidly runs on to ulceration and gangrene. If recovery has taken place, the site of the ulcer will be marked by an extensive cicatrix. In a large proportion of such cases firm fibrous ankylosis of the jaw results, a condition which seriously interferes with alimentation.

A doctor's visit is considered by many to be incomplete unless the **tongue** is inspected. It must not, however, be simply looked at as a matter of routine, but examined intelligently. If the patient be asked to protrude the tongue it is usually fully exposed, and occupies the middle line. Occasionally, and especially in children, the tip alone is extruded in cases where the fraenum linguae is short and firm, while in adults this may be due to ulceration of the fraenum or to enlargement of the tongue from many causes. Again, in hemiplegia the tongue is pushed *towards* the paralysed side when protruded; in chorea it is protruded spasmodically, and continues to move in a jerky fashion while attention is being directed to it; and in chronic alcoholism there is a trembling of the tongue when protruded, resembling the tremor which occurs in the late stage of typhus and enteric fevers.

The tongue may be large, pale, and flabby, with indentations on the edges corresponding to the teeth, as in chronic dyspepsia; it may be red and raw-looking, as in the earlier stages of some fevers; and it may show the red injected papillae appearing through the white fur, and producing what is known as the "strawberry" tongue of scarlet fever. The coating on the tongue known as "fur" consists for the most part of epithelial cells, and whatever tends to irritate or inflame the tongue, by increasing the blood supply to part of the tongue or to the whole organ, causes the epithelium to be formed more rapidly than it is shed, and in this way adds to the fur. Gastric disturbance is the most common cause of a generally furred tongue. Fur limited to one side or to some particular part of the tongue may be due to direct irritation, as from a sharp tooth; to inflammation of a neighbouring part, such as acute inflammation of the tonsil; or it may be, as pointed out by Mr. Hilton in his lectures on *Rest and Pain*, produced by a reflex mechanism through the second and third divisions of the fifth nerve. The irritation in this case is caused by a carious tooth, and the fur is limited to the portion of the tongue supplied by the fifth nerve, namely the anterior two-thirds. Mr. Hutchinson, however, in the *London Hospital Reports*, vol. iii., takes exception to this, and says that one-sided fur of the tongue is caused simply by the circumstance that its subject is accustomed from habit, from loss of teeth or the like, to eat on only one side of the mouth.

The circumvallate papillae, which are placed at the junction of the anterior two-thirds with the posterior third of the tongue, are eight to ten in number, and are arranged in the form of a V with the point directed backwards. They are sometimes unduly prominent, but even when of the average size they are apt to be, and often are,

mistaken by patients for a diseased condition. These, and the veins at the base of the tongue, which occasionally become varicose—the so-called "throat-piles" of Mr. Lennox Browne—are best examined by the help of a laryngeal mirror.

Then there may be spots of thrush similar to those found on the lining membrane of the cheek, and often occurring here in large numbers. Fissures on the dorsum of the tongue may be observed as a syphilitic lesion, and mucous patches may be met with on any part of the tongue, but most frequently near the tip or along either edge, their site being frequently determined by some irritant, such as a tobacco pipe or a ragged tooth. Over the surface of the tongue there may be "bald patches" of syphilitic origin, caused by destruction of the epithelium, and side by side with these there may be warts and condylomata from hypertrophy of the papillae. These usually occur over the dorsum in front of the circumvallate papillae. The surface of the tongue, again, may be scarred, or, as in a case known to many of my students, the greater part of the muscular tissue may be replaced by cicatricial tissue, the result of the breaking down of gummata, followed by cicatrisation of the resulting ulcers. In such a case, the whole tongue becomes hard and almost devoid of sensation. Epithelioma, which in its early stage is apt to be mistaken for a syphilitic lesion, may occur on any part of the tongue, and the hard-edged ulcer may be small and limited to the tongue, or it may be very large and involve neighbouring structures.

The tongue, again, may be greatly increased in size. This may arise from a uniform syphilitic infiltration or gumma, a manifestation of tertiary syphilis in which there is little complaint of pain, and the organ on palpation is felt to be hard and firm. In acute inflammation (glossitis)

the tongue is not only greatly swollen but is tender to the touch, and should this go on to suppuration fluctuation may be detected. In this latter condition the size of the tongue interferes with both feeding and breathing, and the patient usually has the mouth widely opened owing to the obstruction to respiration, while in some cases the tongue, on account of its size, projects from the mouth. A somewhat similar appearance may be produced by swellings beneath the tongue, the commonest of which is ranula. This is a cystic tumour in the sublingual region, consisting of a collection of glairy mucus pent up in one of the follicular glands of the floor of the mouth. It has seldom any direct connection with Wharton's duct or the salivary gland. Wharton's duct, however, may be blocked as a result of inflammation, or the impaction of some concretion or calculus, and the submaxillary gland as a consequence may attain a large size, and even go on to suppuration. As a part of the same condition the sublingual gland of the same side may also become enlarged, when the tongue will be pushed upwards and towards the unaffected side.

The *fraenum* may be unduly short, which in infants is a hindrance to sucking, and it may also be the site of ulcers which may be either simple or syphilitic, or one of the accompaniments of whooping cough.

While making an examination of the tongue it will be found necessary in certain cases to test the patient's sense of **taste**, and in some the **tactile sense** as well. In testing the former it is necessary to employ substances other than odoriferous materials, which are detected more by the sense of smell than by taste. The nerves which serve as the special nerves of taste are the terminals of the *glossopharyngeal* and *lingual* nerves, distributed over the mucous membrane of the tongue and palate. In addition, the

chorda tympani is held by some to be the nerve of taste at the anterior part of the tongue. If the intention is to examine the tongue alone, this organ should be protruded while making the test. The substances employed must be soluble; picric acid as a bitter and sugar as a sweet substance are convenient as tests; and it is well to remember that, in their application, the effect is increased by friction. Taste is said to exist only for acid, bitter, sweet, and saline substances. The sensation may also be excited by the passage of a constant current of electricity through the tongue. If the positive pole or anode is placed on the organ, and the negative on an indifferent part of the body, an alkaline taste is produced, and if the negative pole or cathode be similarly applied, an acid taste results.

The tactile sense is best tested according to Weber's method by means of a pair of compasses.

MODE OF ILLUMINATION.

Those parts which have been described can be readily examined, in the majority of cases, by seating the patient so that his face is directed towards the window. The parts immediately beyond, viz., the fauces and a portion of the pharynx, can in a similar way be examined, with or without the help of a tongue depressor. But to be able to examine the posterior surfaces of the fauces, the upper part of the pharynx and the interior of the larynx, a brighter light than is usually obtainable in the consulting room from the sun is required, along with special reflecting apparatus.

For purposes of **illumination**, the flat flame of an ordinary gas jet, or of an oil lamp, will be found very serviceable, and it is well to accustom one's self to their use, as in general practice one may, at any time, be under the

necessity of making an examination with the help of one or other. When compelled to make an examination at the bedside, an oil lamp may be employed, or the electric light may be resorted to. This latter may be used in the form of a small lamp which, fitted to a laryngeal mirror (to be described) is placed within the mouth; or the lamp (photophore) may be adapted to a forehead band or spectacle frame, and so arranged that the rays are directed from the forehead of the examiner into the patient's opened mouth. These may be lighted by means of small accumulators or primary batteries of various sorts. For the consulting-room probably the most useful, reliable, and most easily managed light is ordinary gas, used with a bracket which is readily raised or lowered, and which may be fixed at any desired level, after the style of Morell Mackenzie's rack-movement bracket. With this it is well to have an Argand burner (circular flame), or a Welsbach incandescent hood, and to have the light enclosed within a concentrator—a metal funnel furnished with a bull's-eye lens. The advantage of this is that a bright light is obtained, which may be concentrated on any particular point while the rest of the room is kept in comparative darkness. The Welsbach hood, which is now much more durable than when first introduced, gives a bright white light. The oxyhydrogen lime light is employed by some, and it also is much less troublesome since the introduction of the Zinconium disc as a substitute for the friable lime.

THE LARYNGOSCOPE.

The special reflecting apparatus is spoken of as the **laryngoscope**, and it is an instrument of comparatively recent introduction. Its employment in diagnosis dates from 1857 when, through the instrumentality of TÜRCK

of Vienna and CZERMAK of Pesth, the use of this invention of a London singing master (SIGNOR GARCIA), by which he some years earlier had watched the movements of his own vocal apparatus, was urged upon the profession. It consists of two parts: (1) a large mirror termed the **forehead mirror**, which, worn on the head by the surgeon, is used to reflect the light from the lamp into the patient's mouth. It should be a concave circular

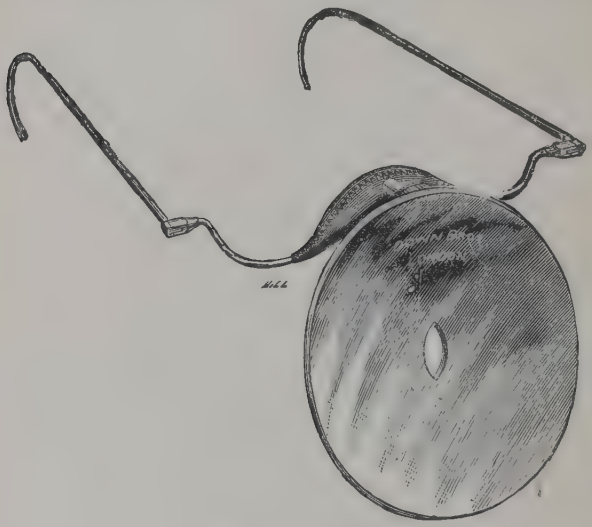

FIG. 3.—Forehead mirror on spectacle frame.

mirror, about three inches in diameter, with a focal distance of fourteen inches and perforated in the centre, preferably with an oval opening. This mirror may be fixed by means of a ball and socket joint, to admit of movement in all directions, to a forehead band or to a spectacle frame, which latter I, for many reasons, prefer.

(2) The second portion or **laryngeal mirror** consists of

a small mirror made of glass backed with amalgam and set in a metal case. The circular form is that most generally useful, though under certain circumstances one of an oval shape is more readily applied, and some prefer the reflecting surface to be lozenge-shaped. It is well to have at least three circular mirrors varying in diameter from a half to one and a quarter inch, each of which is fixed to a metallic stem of about four inches in length, and in such a way that the mirror and stem meet at an angle of 120°. The stem should be pliable to admit of this angle being altered when desired, and fixed to a wooden handle by means of a screw or otherwise.

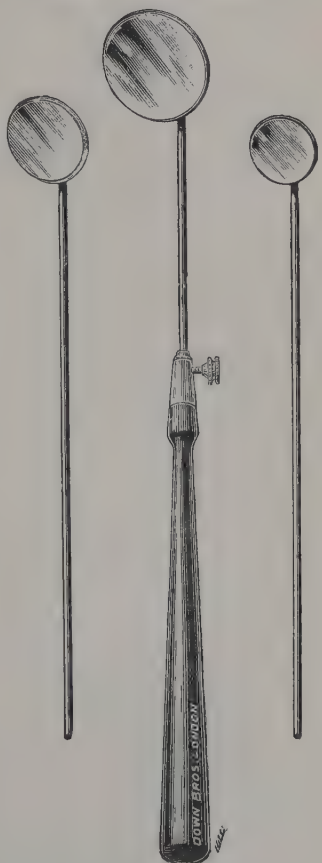

FIG. 4.—Laryngeal mirrors.

PALATE, FAUCES, AND PHARYNX.

Having considered the means employed for the illumination of the cavity of the mouth and of the parts beyond, the next proceeding is to discuss the methods of inspecting the fauces and pharynx. This may be accomplished, and in quite a satisfactory fashion, by

turning the patient towards the window, and directing him to breathe deeply through the widely opened mouth. The tongue may lie on the floor of the mouth, and a good view may be had of the parts behind. But as it is usually necessary in cases under special examination to look beyond the fauces, he should be so placed to begin with that without further change of position the examination may be completed. The patient is seated on a chair in the upright position, with the knees together : and the surgeon sits facing the patient. The gas bracket or lamp is so arranged that the flame or the bull's-eye is on a level with the patient's ear, and preferably at the patient's left side. The forehead mirror is then so adjusted that the light is reflected from it on to the patient's lips, and before going further, care should be taken that the brightest illumination possible under the circumstances is being had, without unnecessary struggles on the part of the surgeon to attain a comfortable position. It is advantageous also to be provided

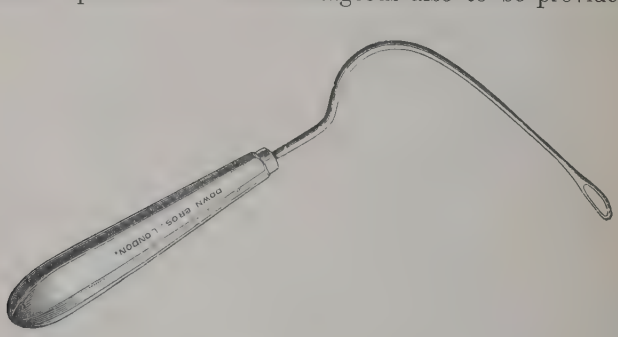

FIG 5.—Fränkel's tongue depressor.

with a tongue depressor. For purposes of examination, one having a narrow blade, such as FRÄNKEL'S, is the most useful and least resented by patients. It consists

of a long narrow fenestrated blade, curved to adapt itself to the curve of the tongue, and roughened on the under surface around the opening the more efficiently to grasp the tongue. The blade is fixed to a long wooden handle, by which it can be readily held in position without the surgeon's hand interfering with the line of vision. This narrow depressor is also useful in the examination of the lips, edges of the tongue, the gums, and the lining membrane of the cheeks; and by getting the uvula into the fenestrated portion, the soft palate can be elevated and a considerable part of the pharyngeal wall exposed.

Having the patient seated as described with the light reflected from the forehead mirror falling on the lips, he is requested to breathe quietly through the widely-opened mouth. By way of response he very frequently breathes through the nose. While breathing with the mouth open, if the tongue lies on the floor of the mouth as it does in those who have had special training in the use of the voice, the fauces are freely exposed. In many, however, the dorsum of the tongue rises up and hides the parts beyond, and it becomes necessary to use the tongue depressor. In applying it, it should be placed well over the tongue, with the fenestration over the central circumvallate papilla, and pressed gently but firmly downwards towards the floor of the mouth. If this is done gently, retching is usually avoided, except in those cases where the sensitiveness of the reflexes is extreme. The parts brought into view should then be carefully and methodically examined, and it is well to recollect in the first place the various structures which can be seen.

There is (1) the hard palate and (2) the soft palate terminating at the centre posteriorly in (3) the uvula. Then stretching from the base of the tongue at either

side is (4) the right and (5) the left anterior faucial pillar, behind which are (6 and 7) the posterior faucial pillars also blending with the base of the uvula; and lying between the anterior and posterior pillars are (8 and 9) the tonsils, one on each side. As a background (10) a portion

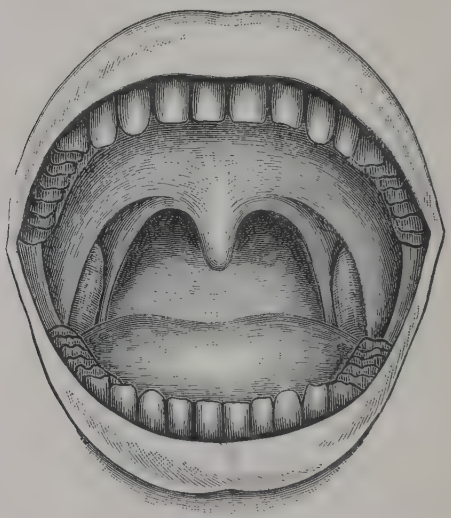

FIG. 6.—Buccal cavity with view of palate, fauces, and pharynx (after Lennox Browne).

of the posterior wall of the pharynx is seen. Those ten structures are constant where the parts are normal. In some cases, more frequently in children than in adults, the upper edge of the epiglottis may be observed, especially if the tongue be drawn forwards, or during the act of retching.

If the parts are examined, as they should be, in the order given, there will be little risk of overlooking any abnormality or evidence of diseased condition present.

The Palate.—In an examination of the **palate** the

patient's head requires to be thrown well backwards. It may be observed that the form of the palate varies considerably. The roof may be unusually high, and the lateral walls unduly close to each other. This narrow high palate, which is associated with a very narrow alveolar arch, is chiefly found in the subjects of congenital syphilis, and I have seen it in a very marked degree in imbecile children, the offspring of syphilitic parents. It, however, may be found in people who have no syphilitic taint. On the other hand, the surface of the palate may be unduly flat, chiefly from absorption of the alveolus following the loss of the teeth, a condition which often gives a dentist considerable trouble in the application of a denture.

Paralysis of the Palate may be met with as a sequela of diphtheria, and as one of the earliest of the post-diphtheritic pareses. It may also occur as a result of disease of, or injury to, the temporal bone. More rarely cases occur in which it is present as one of the features of glosso-labio-laryngeal paralysis. When paralysed, the whole palate appears relaxed, reflex movement is abolished, and it hangs loosely and remains stationary during deep inspiration, during deglutition, and while the patient speaks. As a consequence, food, especially in fluid form, tends to return by the nose during the act of swallowing, from non-closure of the naso-pharyngeal opening, and speech is characteristically nasal.

The palate may be cleft, perforated, or absent from congenital malformation, or as the result of accident or disease. In the course of development the palatine processes approach each other, and with the descending nasal septum unite in the middle line. When this fusion has not occurred, an opening or cleft remains, and its extent depends on the period at which development was arrested.

It may simply affect the uvula, when we find that appendage bifid; or it may involve the soft palate, the cleft stopping short at the edge of the hard palate; or in other cases the fissure may extend throughout the length of the palate, soft and hard. These latter cases, along with those where the anterior portion of the hard palate alone is cleft, are usually associated with hare-lip, single or double.

Again, the palate may be perforated, usually as a result of the destructive action of syphilitic inflammation. The gummata which form here frequently appear suddenly, and progress rapidly, and the destructive process is deep. Sometimes the resulting perforation is in the form of a small circular opening through the hard palate into the nose. Speech is then characteristically affected, and during the swallowing of fluids a portion is apt to return through the nose. The necrotic action, however, may be much more extensive, causing not only the disappearance of the palate, both hard and soft, but affecting the nasal bones as well. Such a case (a woman, aged 30, from Greenock) was recently under my observation at the Western Infirmary. Within three months of the time she first felt pain in the roof of her mouth, the buccal and nasal cavities had become continuous, owing to the destruction of the palate, vomer, and cartilaginous septum. Paget in his *Lectures on Surgical Pathology* refers to a case where destruction of the palate resulted from absorption consequent on pressure. The woman had an aperture in the hard palate, and was accustomed to plug it by means of a cork, in order to remedy the discomfort caused by its presence. The constant pressure of so rough an obturator produced absorption of the edges of the opening, making it constantly larger, and requiring that the cork should be often wound round with tape to fit the widening gap. The

remedy thus went on increasing the disease, till of all the palatine portions of the upper maxillary and palate bones nothing but their margin and outer shell remained, the rest having all become absorbed.

Where the parts are intact, the **colour** of the surface should be observed. This may, like the lips, be pale as in general anaemia, and the undue pallor may be brought into greater prominence by a localised hyperaemia, such as is frequently met with in anaemia at the free border of the anterior pillars. General hyperaemia may vary in degree, and may be associated with a variety of conditions. It may be the result of local irritation, as from the use of highly spiced foods, or the excessive use of tobacco or alcohol. When the latter has been used to the extent of producing gastric disturbance, the hyperaemia of the palate and fauces is sometimes extreme.

In simple catarrh due to a common cold a general reddening, involving the surface of the hard and soft palate, the fauces, the tonsils, and pharynx, will be observed, the depth of colour corresponding, usually, with the acuteness of the attack. Similarly in measles, especially where catarrhal symptoms predominate, injection of the fauces is frequently met with, and the hyperaemia is of wide distribution. The coryza, and the mottled skin eruption will point to the cause. In scarlet fever a somewhat similar condition is almost invariably met with, and in varying degrees, at an early stage of the disease. It is associated with a higher temperature than is present in simple catarrh, and the accompanying eruption over the body will at an early stage remove doubt as to its nature. Associated with those conditions, especially where the inflammatory process is severe, a swollen and oedematous state of the uvula is found, causing trouble in breathing, and giving rise to a frequent irritating cough, and in some

cases to sickness and retching. A general injection of the palate and fauces, which is very similar to that met with in scarlet fever, occurs as one of the earliest of the constitutional manifestations of acquired syphilis. This hyperaemia, however, in the course of a few days becomes limited to the soft palate, or it may be to the anterior pillars and tonsils, while the line of demarcation between diseased and healthy tissue becomes sharp, and the affected areas on the two sides are symmetrical. White spots of thrush may be found on the palate and fauces, similar to those met with on the tongue and lining membrane of the cheeks, and under similar conditions. Herpes may also affect those parts, and when it occurs on the soft palate the vesicles may rapidly become purulent. When these rupture, small superficial circular ulcers result.

The **uvula** may be considerably elongated, pale and flabby from a relaxed state of its mucous membrane. When this is the case it tapers towards the point, which may be found resting on the dorsum of the tongue. It may, again, be bulbous from hypertrophy, when its surface is usually bright red; its size may be considerably increased from oedema, or it may be bifid as already described. In some cases the uvula may be absent, occasionally as a congenital deformity, but more usually as the result of ulceration, this in the majority of cases being due to syphilis. As a result of this same disease, where the ulceration has been extensive rather than deep, not only may the uvula be destroyed, but the edge of the soft palate may have been encroached upon, causing it to have an irregular outline Occasionally a case may be seen where the palate and the pharynx have become united, the result of cicatrisation following extensive ulceration of the fauces and pharynx.

When examining the **fauces** it is well to observe the

relative position of the pillars and tonsils. When the parts are in a normal condition, the tonsil on each side shows out behind the anterior pillar towards the middle line, and the free border of each posterior pillar in its turn comes nearer to the middle line than the tonsil.

The Tonsils.—The tonsil in different people varies greatly, both in size and shape, and the two in any given case may be totally unlike each other. Its size and appearance may be greatly altered by inflammation. It may appear as a large red globular swelling when the substance of the gland is inflamed, this affection being termed tonsillitis or quinsy. When both are so affected they may meet in the middle line. The tissues around this inflamed tonsil, and chiefly the surrounding loose areolar tissue, may also become inflamed (peritonsillitis) and go on to suppuration, with or without suppuration occurring in the tonsil itself. Instead of the inflammation affecting the tonsil as a whole, the crypts or follicles may alone be implicated, when the condition is termed follicular tonsillitis. The mouths of the follicles are filled with a white secretion, and on account of the surface of the tonsil being thus studded with white spots, it is known in some parts of the country as "spotted sore throat." It is usually of a simple character, and has no connection with diphtheria, with which, however, it is frequently confused. In both forms of tonsillitis the patient speaks thickly, and has difficulty in swallowing and in breathing. This is accompanied by headache, general malaise, and the constitutional disturbance is occasionally severe; there is a high temperature, rapid pulse, and foul tongue. Mucous patches are frequently met with on the tonsils. As the hyperaemia, described as an early manifestation of secondary syphilis, is disappearing, portions of the

tonsil become white and glistening, presenting an appearance very similar to the mark produced by the passage of a snail over a stone or blade of grass: thus those glistening marks have been called snail-tracks. In the course of a few days these become white and opaque from necrosis of the epithelium, forming typical "mucous plaques." In unhealthy patients the surface so affected may rapidly become eroded, but in those who are otherwise in good health they tend to disappear spontaneously.

The tonsil may be the seat of a deep ulcer, usually syphilitic in nature; but occasionally the ulcer may be of that of an epithelioma. In its earlier stages this latter is apt to be mistaken for the former. Primary epithelioma of the tonsil, though denied by some authorities, does occur. Personally, I have seen at least three cases, one of which was exhibited by me before the Glasgow Medico-Chirurgical Society, and the notes published in the *British Medical Journal*, November, 1890. Usually, however, when epithelioma attacks the tonsil it is due to the spread of the disease from the tongue or other neighbouring structure. The ulcer is similar to that met with on the tongue and, like it, occurs after middle life. Its edges are irregular, slightly elevated, and hard on palpation, and the surrounding tissue of the tonsil is infiltrated. The surface of the ulcer is usually coated with foul smelling discharge, and if this is cleared away the surface exposed is raw and angry-looking, and bleeds on slight provocation. The spreading of the ulcer is frequently accompanied by severe haemorrhage. Pain is also associated with this ulcer: it is most frequently complained of in the ear, or as shooting to the ear on the affected side. It is out of all proportion to the size of the ulcer, standing thus in marked contrast

to the majority of cases of syphilitic ulceration, where little or no pain is complained of, even where there may be great destruction of tissue. The lymphatic glands on the affected side become enlarged, and deglutition is accompanied by severe pain.

Sarcoma of the tonsil is occasionally met with. Its growth is rapid, and it increases in all directions, attaining in some cases enormous proportions. On account of its size it interferes with deglutition and with respiration, and from the latter cause, sleep, as in children with enlarged tonsils, is much broken. On palpation the sensation experienced closely resembles fluctuation, from the high elasticity of the tumour, but should it be explored with a needle blood alone escapes. The patient's pulse is weak and rapid, and he quickly loses flesh and strength.

During the course of scarlet fever, as has been said, the fauces invariably become affected, and when the patient is the subject of enlarged tonsils, these become specially implicated. Their surface may present the same redness found in catarrhal states; they may be coated with tenacious mucus; or they may be covered with white patches, which, it is important to note, can readily be brushed away. Under certain circumstances, when the patient is unhealthy, the surroundings unhygienic, the local inflammation very acute, etc., superficial ulceration may occur, and in some cases actual sloughing of portions of the mucous membrane, or even of the substance of the tonsil, may be met with as a complication. The white patches and the grey sloughs on the surface of the tonsil are readily mistaken for diphtheria.

The membrane which is met with as a characteristic part of diphtheria appears, in its early stage, as a viscid, yellowish secretion, collected for the most part in the

depressions of one or both tonsils. The superficial layers of the mucous membrane become infiltrated at certain points, and these parts become elevated above the level of the surrounding surfaces. These patches rapidly assume a greyish-white appearance, they tend to spread, sometimes rapidly, and to coalesce with similar adjacent patches. In this way the whole surface of the tonsil may be covered with false membrane, as it is termed, which soon becomes tough and leathery. It may in like manner spread over the fauces, and pharynx, as well as to the nares, the larynx, the trachea, and the bronchial tubes.

As already stated, those patches of exudation will be seen on examination to involve the mucous membrane, so that if they are stripped off, the surface beneath will be found denuded of its epithelium, and bleeding at various points. The white spots of secretion found in follicular tonsillitis, on the other hand, which simply lie *on* the surface, can be readily brushed away, leaving the underlying mucous membrane intact.

The size of the tonsil may be increased by the presence of a foreign body, usually composed of the normal secretion, with a deposit of lime salts, which has been retained within the lacunae of the gland. Of foreign bodies introduced from without, those most commonly met with are fish bones. These not infrequently enter one or other of the lacunae, especially when the patient has enlarged tonsils. When a fish bone is thus retained and moistened with saliva it becomes almost transparent, but with a good light it is readily detected, and is usually easily removed.

The Pharynx.—The condition of the **pharynx** should next be investigated. That part which is seen through the open mouth is termed the **buccal pharynx**, but it

must be remembered that the pharynx proper extends from the basilar process of the occipital bone above to the interval between the fourth and fifth cervical vertebrae below, and that the posterior wall throughout that length is uninterrupted, and is continuous with the oesophagus and larynx. Anteriorly its wall is interrupted by the nasal and oral cavities. The posterior wall of the pharynx seen through the mouth may be pale as in anaemia and leucocythaemia, or it may be congested to a varying degree. During the course of a catarrh, in scarlet fever, and in those who have recently been imbibing alcohol freely, the pharynx may be deeply injected, and in most cases the fauces will be similarly affected. The hyperaemia met with, however, may be limited to the posterior wall of the pharynx, when the individual vessels, being deeply injected, are readily traced over the surface, and the various mucous follicles are seen to be hypertrophied. This, from the rough appearance of the surface, is termed granular pharyngitis. It is frequently associated with rheumatism, and occurs in those who habitually use the voice to excess.

Again, the pharyngeal wall may be thinned from atrophy, and the surface dry and glazed, the condition being termed *pharyngitis sicca*; or the surface may be coated with tough muco-purulent secretion; or the discharge may be crusted on its surface. When muco-pus is present it is apt to be mistaken for discharge covering an ulcer, but if it be removed with a swab the mucous membrane beneath is found to be intact. When the discharge has become crusted, the crusts are often dark in colour from impurities in the inspired air. They are larger and harder the nearer they approach towards the upper part of the pharynx, where they sometimes stand out like crusts of rupia; and if the pharyngeal surface is carefully exam-

ined, from above downward, the dry coating will be observed to become somewhat moist, while at or immediately below the level of the dorsum of the tongue, the lower edge of the coating will be seen, the surface of the pharynx at a lower level being free from discharge. It is frequently associated with a chronic inflammatory condition of the nares, accompanied by a foul-smelling breath.

Syphilis affects the pharynx, as it does the fauces, both in its secondary and tertiary manifestations; so that mucous patches and superficial erosions, gummata, or deep and extensive ulcers may each be met with here. The latter may be coated and hidden by a thick layer of muco-purulent discharge, very similar to that seen in chronic pharyngitis. It only requires removal with a swab to show the difference between the two conditions. The cicatrisation following an extensive ulcer may alter the appearance, as it interferes with the function, of the pharynx and the neighbouring structures.

A simple ulcer, the result of injury, may be met with. Such a case came under my care, where a small boy while running, with a tin-whistle in his mouth, fell. The pharyngeal wall was extensively lacerated, and when seen by me he had a large circular ulcer on the posterior wall.

Sometimes the pharynx is occupied by a swelling, which may be in connection with the pharyngeal wall itself or, springing from some neighbouring part, project into it. Among the former may be mentioned post-pharyngeal abscess, which appears as a smooth, rounded, fluctuating projection. It is a collection of pus between the pharyngeal wall and the vertebrae; is usually the result of caries of the bodies of one or more vertebrae; and is most frequently met with in children.

In children, again, the posterior wall of the pharynx, above the level of the soft palate, is frequently the seat of adenoid vegetations. These growths consist of lymphoid tissue, nearly identical in structure with the tonsils, and they may attain to such a size as to completely block the pharyngo-nasal cavity, thereby hindering nasal respiration, and interfering with hearing by occlusion of the Eustachian tubes, these effects combining to give the patient's face a dull expressionless appearance. Children so affected, besides lacking facial expression, are dull mentally, and apparently unable to fix their attention, a condition termed *aprosexia* by Guye, who ascribes this mental apathy to interference with the lymphatic circulation of the brain. The lower border of this collection of growths may readily be seen by the help of a small mirror, but they are best examined by passing the forefinger through the mouth and up into the space behind the soft palate. These vegetations in the early stage are soft and friable, like granulation tissue, and when broken down by contact with the finger-nail during an examination they bleed freely. In cases of long standing, fibrous tissue becomes developed, especially towards the base of the individual growths, and they become firm and tough. They tend to spontaneous atrophy at puberty.

The pharynx may be occupied by a sarcomatous tumour, originating it may be from the base of the skull, from either superior maxilla, or in connection with the cervical vertebrae. A case under my care in the Western Infirmary (sent by Dr. Cunningham of Alva) was that of a man, thirty-eight years of age, and otherwise healthy, with a swelling of three months' duration at the back of his throat. On examination, the soft palate was seen to be pushed forwards and to the left side, and below the free border of the palate was the rounded edge of

a globular mass. It completely filled the upper portion of the pharynx, was firmly fixed and highly elastic on palpation, and it increased with great rapidity during the short time it was under observation. When of smaller size, such a tumour may be mistaken for post-pharyngeal abscess, but if explored, blood alone escapes.

Polypi, mucous or fibrous in structure, may be found occupying the pharynx more or less completely. These may spring from any portion of the wall of the pharyngo-nasal space, and hang downwards; or they may originate, as the majority do, within the nasal cavity, and, projecting through the posterior nares, appear in the pharynx. They may attain the size of a small Tangerine orange, and be visible through the mouth, hanging below the level of the soft palate. In such cases the patient's voice lacks nasal resonance.

THE LARYNX.

Having completed the examination of the fauces and pharynx, the attention is next directed to the state of the **larynx.** As already mentioned, alterations in the breath-sounds and in the voice are recognised and noted during the preliminary examination of the patient, and having thus taken advantage of the sense of hearing, the parts then are viewed by means of the laryngoscope. The fauces being illuminated in the way already described, a laryngeal mirror of suitable size is chosen, and slightly heated by holding it over the flame of the lamp for a second or two, or by plunging it into hot water. The former is the method usually adopted. After a little practice the proper temperature can readily be gauged by applying the non-reflecting surface of the mirror to the back of the hand, and it is well to be certain that

the instrument is sufficiently cool before introduction, to avoid injury to the adjacent tissues, as well as loss of confidence on the part of the patient. The object of heating the glass is, of course, to prevent the deposition of moisture which would otherwise take place on the surface. The laryngeal mirror is then held lightly in the right hand, between the thumb, fore, and middle fingers, as one would hold a pen; and it may thus be raised, lowered, or moved readily and freely in other directions simply by the movements of the fingers.

The patient is then asked to protrude the tongue, which, after being covered by a single layer of towelling of fine texture to prevent its slipping from the grasp, is seized between the thumb and forefinger of the left hand—the thumb being above and the finger beneath the organ. It is thus held gently but firmly, and while it is necessary to have it held steadily as well, special care must be taken to avoid traction. This latter is best accomplished by resting the middle or third finger on the patient's chin. By keeping the forefinger slightly above the level of the teeth, the fraenum and the lower surface of the tongue are protected against the sharp edge of the lower incisors, and this is of importance to the patient's comfort. Excessive traction on the tongue and sawing of its under surface are errors committed by every beginner who has not been warned to guard against them.

The tongue being held as directed, with the mouth widely opened and the light falling on the fauces, the laryngeal mirror, suitably warmed, is then introduced. In its introduction it should be carried with its reflecting surface downwards, midway between the tongue and the palate, care being taken not to allow contact with any of the surrounding parts until the posterior edge of the soft

palate is reached. With the mirror resting here, against the base of the uvula, the soft palate is pushed upwards and backwards until it almost touches the posterior wall of the pharynx. The patient should then be requested to say **Ah!** or **Eh!** when, if the handle of the mirror is slowly raised, and at the same time moved towards the corner of the mouth, a full view of the interior of the larynx will, in the majority of cases, be afforded. It is well to practice the introduction of the laryngeal mirror with the left hand as well as with the right, as in the application of remedies which can only be done accurately under the guidance of the eye, ambidexterity is necessary.

Before describing the laryngeal image, attention may be drawn to **some conditions which hinder** a full view of the larynx being obtained. And first, a beginner has considerable difficulty in arranging the light properly. He may find that when the laryngeal mirror is in position the light is misdirected, or the illumination insufficient. When such is the case, the mirror should be at once withdrawn from the mouth, and the brightest light at command thrown on the fauces before its re-introduction.

Again, from want of confidence he fails to place the mirror sufficiently far back. When such is the case, the base of the tongue and the lingual surface or lip of the epiglottis may be reflected in the mirror, a state of affairs which is at first puzzling, but which is readily remedied by pushing the mirror further backwards and upwards. Irritability of the fauces is a frequent source of trouble. This irritability varies in degree, retching beginning in some patients before the mirror has fairly entered the mouth, while in others it is induced whenever the mirror touches the palate. When the patient is excitable, it is often well to introduce the mirror for a few seconds only and then to withdraw it, repeating this manoeuvre fre-

quently. By such means nervousness may be gradually overcome, and a full view of the parts obtained. When retching has been induced, the mirror should be withdrawn altogether, and its introduction should not again be attempted until the patient has had a distinct rest. A glass of cold water is often of service in lessening this irritability. In former times a large dose of bromide of potassium was occasionally administered prior to a laryngeal examination, and the sucking of ice was frequently prescribed. Now, if the examination is not at once completely satisfactory, or if it is necessarily a prolonged one, the fauces may be anaesthetised with a 10 per cent. solution of *hydrochlorate of cocaine*, applied by means of a swab or spray. It is perfectly harmless, and wonderfully efficacious. Considerable trouble is sometimes experienced from the presence of an elongated uvula, and also when the patient, disregarding instructions, will persist in breathing through the nose.

Enlargement of the tonsils occasionally acts as a hindrance to a satisfactory laryngeal examination, but by the use of an oval mirror in place of a circular one the examination may be made quite complete, even where the tonsils are much hypertrophied.

Lastly, the position of the epiglottis may in many cases interfere with a proper view of the interior of the larynx. This is especially the case where the epiglottis is elongated and pendent, somewhat resembling the half-raised lid of a box. To illuminate the interior under such circumstances the mirror must be placed well back, and as far down as possible. When in this position the patient should be requested to sound a high falsetto note, or to laugh, when the epiglottis will probably become erect. If the desired result is not thus attained, the parts may be anaesthetised with cocaine, and the epiglottis raised

by means of a blunt hook, or by pressure on the glosso-epiglottic folds by a curved spatula.

The Laryngeal Image.—When the mirror is *in situ*, the relative position of the various structures and their appearance should be carefully observed. The extent of the view obtained varies greatly, depending to a considerable extent on the position of the epiglottis. When that cartilage stands upright, not only can the interior of the larynx be readily illuminated and examined, but the trachea throughout its length may be viewed, and its division into right and left bronchi clearly seen.

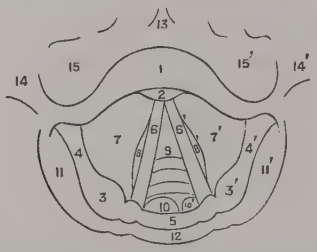

FIG. 7.—Outline diagram of the larynx and its immediate surroundings, as seen in a mirror from above :—1, Epiglottis; 2, cushion of epiglottis; 3, 3′, right and left arytenoid prominence; 4, 4′, right and left ary-epiglottic fold; 5, inter-arytenoid membrane; 6, 6′, right and left vocal cord; 7, 7′, right and left ventricular band; 8, 8′, entrance to right and left ventricle; 9, anterior wall of larynx and trachea; 10, 10′, right and left bronchus; 11, 11′, right and left hyoid fossa or sinus pyriformis; 12, oesophagus; 13, central glosso-epiglottic ligament (*fraenum epiglottidis*); 14, 14′, right and left lateral glosso-epiglottic ligament; 15, 15′, right and left glosso-epiglottic fossa.

At the upper part of the mirror will be found the **epiglottis**, the shape of which in different individuals is as various as is the form of the nose. In the great majority of cases the epiglottis is so curved that a portion of both its anterior and posterior surfaces are seen at one and the same time, the posterior surface as it curves forwards being termed the **lip** of the epiglottis. Towards the lower part at each side the **arytenoid prominence** is

seen, these being the points at which the small cartilages of SANTORINI surmount the arytenoid cartilages. Stretching from the arytenoid prominence to the epiglottis on each side is the **aryteno-epiglottidean** fold (shortly, **ary-epiglottic** fold), and in this fold is the elevation on either side marking the position of the cartilage of WRISBERG. The two ary-epiglottic folds are united posteriorly by the **inter-arytenoid membrane**, or commissure, which varies in length and shape according to the state of the glottis. During deep inspiration it is seen stretched between the two arytenoid cartilages, when it may in some cases be fully a quarter of an inch in length ; whilst during phonation the space between the arytenoids is obliterated by the approximation of those cartilages, the membrane being folded up and directed backwards. Between those two extremes its length and shape vary greatly.

The structures mentioned, namely the epiglottis, the two ary-epiglottic folds and the inter-arytenoid membrane, together form an irregularly circular boundary or framework within which are found certain important structures. Of these the **vocal cords**, two in number, are the most prominent, as they are the most important. They at once arrest the eye of the observer on account of their whiteness, which makes them stand out in marked contrast to the varying shades of pink of the parts around, and also on account of their free movements. When once seen, in their normal condition, they cannot be mistaken. These organs are flattened bands, each of which extends from the base of one arytenoid cartilage to the angle of the thyroid cartilage, where they meet, and as seen in the mirror they together represent an inverted **V**. The space between the vocal cords is termed the **glottis** or **rima glottidis**, and it is ever changing in shape and size. During deep inspiration the cords are widely separated,

and the glottis has a triangular outline with the base of the triangle behind and the apex turned towards the epiglottis; or, on account of the turning out of the vocal processes of the arytenoid cartilages during forced inspiration, the glottis may become lozenge-shaped. During phonation the glottis may be represented by a line, as then the vocal cords approximate and lie parallel to each other, and some hold that during the emission of a high note they may even overlap.

Between the vocal cord and the ary-epiglottic fold on either side there is the **ventricular band**, a reduplication of the lining mucous membrane, running parallel with the vocal cord. These ventricular bands have been called the "superior" or "false" vocal cords, on account of their position, being placed on a higher level in the larynx than the vocal cords proper, and also on account of their supposed action in the production of voice. Normally they have little if anything to do with the actual production of voice, but when there has been extensive or complete destruction of the vocal cords, I hold that they become, physiologically, true vocal cords, as I have observed them under such conditions assume that rôle.

The relationship between the ventricular band and vocal cord is best studied by means of a longitudinal section of the larynx. The laryngeal image in the mirror is apt to give one the idea that the vocal cord is merely the white edge or border of the fleshy-looking ventricular band. In reality those parts are not only not continuous, but they do not even touch each other. The vocal cords are at a distinctly lower level than the ventricular bands, and this must be remembered when making topical applications. Between each ventricular band and vocal cord there is a distinct aperture, which leads into the ventricle of the larynx, or ventricle of Morgagni. A word may here be said

regarding the mucous membrane with which the interior of the larynx is lined throughout, and which is continuous with that of the mouth and pharynx above, and with the trachea below. As it is reflected from the base of the tongue on to the anterior surface of the epiglottis it forms a central and two lateral reduplications, which are termed the glosso-epiglottidean folds, and between these there are

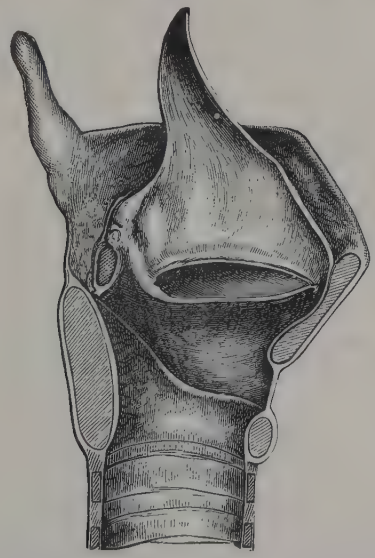

FIG. 8.—Vertical section of larynx in Author's collection, showing the relative positions of the ventricular band and vocal cord, with the entrance to the ventricle of larynx between.

two fossae varying in depth. The mucous membrane is closely adherent to the anterior surface of the epiglottis, and also to the vocal cords, on which parts it is covered with epithelium of the squamous variety, is extremely thin, and in direct contact with the mucosa. The mucous membrane lining the narrow zone just within the entrance

to the larynx is also covered with squamous epithelium. Throughout the greater part of the larynx, including the laryngeal surface of the epiglottis, the mucous membrane, like that lining the trachea and bronchi, has columnar and ciliated epithelium, and by the vibratory movements of the cilia, mucous secretion is directed upwards.

It is well to observe that in a healthy larynx the colour of its lining membrane varies at different parts. The lingual surface of the epiglottis is of a dull pink, while the curved, everted lip is yellow, owing to the colour of the cartilage shining through the pale pink mucous membrane; and the tubercle or cushion of the epiglottis, like its laryngeal surface, is bright red. This is apt to be mistaken for hyperaemia, and the mistake is the more likely on account of the rounded outline of the cushion. The ary-epiglottic folds are very similar in colour to the lips, with a lighter shade over the rounded prominences of the cartilages of Wrisberg and of Santorini. The inter-arytenoid fold is of a rather lighter shade, and sometimes it may even be of a yellowish pink. The ventricular bands are deeper in colour than the ary-epiglottic folds, and the vocal cords are pearly white. When the trachea is visible the rings are seen to be of a yellowish colour, like the lip of the epiglottis; and the mucous membrane between those yellow elevated rings is of a pale pink.

It is to be remembered that the view of the larynx obtained by the aid of the laryngoscope is a reflected one, and as such there are certain facts to be borne in mind. The observer during the examination is seated facing his patient, the patient's epiglottis therefore is the part of the larynx nearest to the observer, and the arytenoid cartilages with the inter-arytenoid membrane, forming the posterior wall, are the parts furthest removed from him. In making an examination, however, the epiglottis

is seen at the upper part of the mirror, and appears furthest from the observer, while the parts forming the posterior wall occupy the lower part of the mirror, and so appear nearest to the observer. The part, then, which in

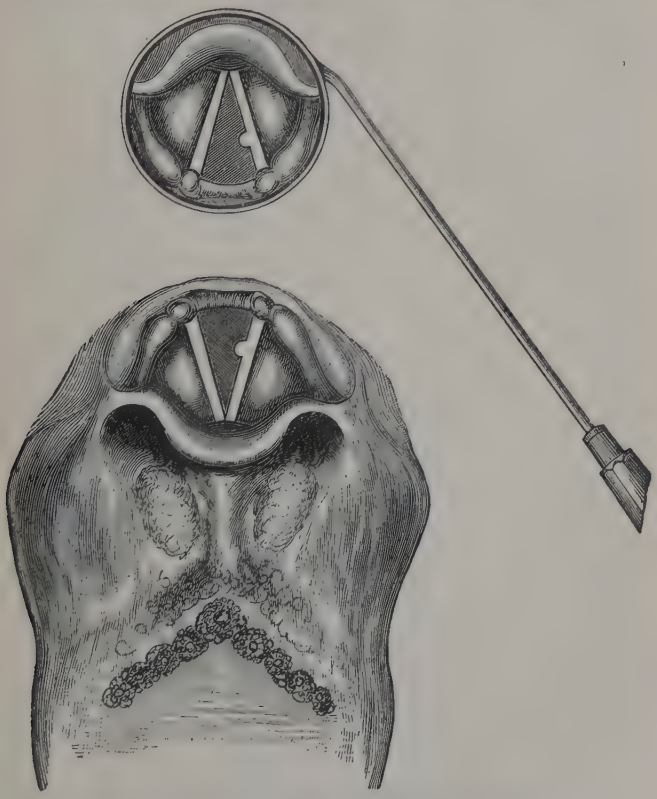

FIG. 9.—Relation of the parts in nature and in the mirror.

reality is nearest to the observer is in the image furthest removed from him, and simply because the image is a reflected one. And for the same reason, as might be

expected, there is no lateral inversion. As the patient sits facing the surgeon, his left hand is immediately opposite the surgeon's right hand, and so the vocal cord which is to the surgeon's right is the patient's left cord. The practical bearing of those points is brought home to one when making applications to any particular part of the larynx; and the difficulties of working under the guidance of the mirror are best appreciated and overcome by practice.

Changes in Colour and Form.—While the form of the larynx may be unchanged, there may be a more or less marked alteration in the colour of the lining membrane, either affecting the larynx generally or limited to some particular locality. The natural red colour may either be paler or deeper than usual. Paleness or **anaemia** of the larynx may simply be evidence of general anaemia, and associated with a similar condition of the lips and fauces; or it may be the anaemia of early phthisis, in which case it is a sign of much importance. In this latter condition the pallor is extreme, and of a much more pronounced character than that of the neighbouring mucous surfaces.

Hyperaemia of the larynx may result from a variety of conditions. Prolonged use of the voice in speaking or in singing, a paroxysm of coughing, inhalation of irritants suspended in the air in the form of solid particles, or of noxious fumes and the like, all tend to produce a general hyperaemia, though it may be of an evanescent character. Catarrh, from exposure to cold, produces a similar general injection of the parts. Hyperaemia again may be localised in almost any part; but this is specially the case with the vocal cords during the prevalence of a catarrh, when in place of flat pearly-white bands they appear rounded in form and pink in colour, and sometimes tiny vessels may be traced coursing over the surface of each.

Having by a general survey observed such changes as are present, the various parts are then examined in detail, and here, as with the fauces, it is well to do so methodically. The state of the veins at the base of the tongue should be observed. A congested condition of those veins is frequently a source of annoyance to a patient, and the appearance of blood in the expectoration consequent on their rupture is sometimes puzzling to the practitioner. The glosso-epiglottic ligaments, with the fossae between, must be carefully explored, especially when the lodgment of any foreign body is suspected. And under similar conditions the sinus pyriformis—that space between the inner surface of the thyroid cartilage and the ary-epiglottic fold on either side—must not be overlooked.

The **epiglottis** is then examined, both its anterior or lingual surface, its lip, and as much as can be seen of its laryngeal aspect. As has already been stated, the epiglottis may vary greatly in shape. It may have a wide curve with the upper edge or lip well curved towards the base of the tongue, and in such a case the interior of the larynx is readily inspected. On the other hand it may be broad and flat, and lie over and obscure the entrance to the larynx. Between these two extremes there is every variety in shape and position. In one form, especially met with in children, the epiglottis appears folded on itself laterally like a conduplicate leaf-bud. When of this shape great patience and much manipulative ingenuity are necessary, to enable the observer to obtain a view of the interior of the larynx. The form of the epiglottis, again, may be altered as a result of disease, and this is especially so as a result of syphilis. Limited portions may be destroyed, as shown in fig. 10, which is a representation of what occurred in a man, thirty-five years of

age, in whom that was the only part destroyed; or the upper portion may be wholly obliterated, in which case

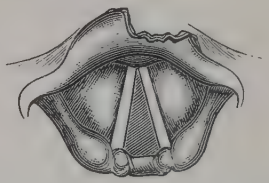

FIG. 10.—Syphilitic necrosis of portion of epiglottic cartilage.

the upper edge may be on a level with the ary-epiglottic folds.

Ulcers may be met with on any part of the epiglottis, and these may be nearly equally divided, as far as my experience both in hospital and private practice goes, into syphilitic and tubercular. In hospital practice syphilis is responsible for the greater number. Those due to syphilis may be of the nature of mucous patches, which have gone on to superficial erosion, and when occurring in this stage of the disease they are usually associated with mucous patches within the mouth or on the fauces, and, it may be, with evidences of the same disease on the skin. Syphilis in its later stages may manifest itself here, as elsewhere, in the form of gummata, the result of specific inflammatory infiltration, and when these break down large and deep ulcers result. They most frequently affect the lip or upper edge of the epiglottis, and seldom occur on its laryngeal surface. These tertiary ulcers are large, irregular in outline, few in number, usually solitary, and surrounded as a rule by an area of inflammation. They cause pain usually only during deglutition, and frequently the pain is trifling when the size and position of the ulcer are considered.

In tuberculosis, the ulcers which form on the epiglottis

are, in their earlier stage, small and circular. They are usually multiple—each ulcer being isolated—and they are scattered over the surface, though later on two or more may coalesce. They are located most frequently on the laryngeal surface of the epiglottis, sometimes on its upper edge, and the surrounding mucous membrane is usually unduly pale. Pain is in all cases more or less present, and is frequently out of all proportion to the size of the sores. When the ulcers by spreading coalesce, the cartilage may be exposed and a portion of it may become necrosed, this being followed in some cases by exfoliation (see Laryngeal syphilis and tuberculosis).

The **tolerance of manipulation**, which may be observed in cases of syphilis of the larynx, stands in such marked contrast to the hypersensitiveness found in most tubercular cases, that it might almost be included amongst the important differential signs.

The epiglottis is rarely the seat of an epitheliomatous ulcer, and when it is so affected it is usually by the spreading of the disease from some neighbouring structure. Cysts and papillomata springing from the surface of the epiglottis may be met with, but they are of rare occurrence, and when present are usually easily seen, and readily diagnosed.

Oedema of the epiglottis is an affection met with under a variety of conditions, and is usually of inflammatory origin. It may be the result of scalding of the parts caused by the accidental swallowing of boiling water, etc., or it may be due to ulceration, tubercular ulceration of the epiglottis being usually accompanied by more or less oedema. It may also accompany syphilitic ulceration, though less frequently, but it is invariably present when there is destruction of the cartilage, whether this necrosis be tubercular or syphilitic in character. Again,

there may be oedema of the epiglottis associated with a similar condition in other parts of the larynx, as may be observed in some cases of acute catarrhal laryngitis, as a complication in Bright's disease, etc.

The appearance of the epiglottis when oedematous varies considerably. It is swollen, and the surface may be brightly injected, or it may be of a purplish tinge, much resembling the inflamed oedematous prepuce seen in paraphymosis. In a case where I demonstrated this condition at my clinique in the Western Infirmary lately, the oedema was limited to the epiglottis, and was due to syphilitic necrosis of the cartilage, and the appearance of the part was very similar to the patulous os uteri, as seen through a Fergusson's speculum—smooth, rounded, and dark red, with the surface moist and having a slit-like opening in the centre. In this case tracheotomy

Fig. 11.—Oedema of the larynx.

was performed for relief of the resulting dyspnoea. When oedema results from some chronic condition, the surface may be pale and of a semi-translucent appearance.

Oedema of the ary-epiglottic folds is of more frequent occurrence than oedema of the epiglottis, or any other portion of the larynx. The resulting swelling is most marked over the arytenoid prominence, where it appears as a smooth globular swelling, semi-translucent, sometimes pale in colour, but usually bright red, and in the majority of

cases unilateral, or at least more pronounced on one side than the other. Both may however be equally prominent. It may, like oedema of the epiglottis, be *primary*, as in acute laryngitis in otherwise healthy persons, or *secondary*, occurring as a sequel to ulceration of the surface, disease of the cartilages, etc. Oedema of the ary-epiglottic folds, and sometimes of the epiglottis, occurs in patients suffering from Bright's disease, the symptoms often appearing quite suddenly. It is not, however, as is frequently supposed, of a passive character, but is almost always the result of inflammation. The more chronic the cause of the oedema the less is the risk to the patient's life; but in acute oedema, or that complicating an acute inflammation, such as results from scald of the larynx, acute catarrhal laryngitis and the like, if not relieved by operation it may prove fatal within a few hours from the time of its onset.

Over the surface of the ary-epiglottic folds mucous patches, similar in appearance to those seen on the fauces, may be found; while one or other of the folds may be the site of ulcers, syphilitic or tubercular, and gummata also occur. When one of the folds is the seat of a syphilitic infiltration, it is more or less swollen and prominent, deep red in colour, and its movements are hampered or, it may be, completely abolished.

The **inter-arytenoid membrane** should next be very carefully inspected, both as regards its upper border and its inner surface. In this latter situation is found, perhaps, the earliest indication of tubercular disease of the larynx, this appearing as a slight elevation of the mucous membrane of a rather paler tint than the surrounding surface (see Tubercle of the larynx). This may be found in cases where deposit can be detected in no other part of the body, and where the subjective signs alone raise

the question of tubercle. Later on, this surface may be ulcerated, or it may be occupied by a mass of granulation tissue overhanging an ulcer which exists at a lower level (see fig. 26).

The affections of the **ventricular bands** are very similar to those of the ary-epiglottic folds. They may become oedematous under similar conditions, but less frequently so than the ary-epiglottic folds. They may be thickened and injected from inflammation of a simple character, or as a result of syphilitic erosion or tubercular ulceration. Again, one or other ventricular band may be the seat of syphilitic infiltration, and so great is the thickening sometimes found here that the movements of the vocal cord on the affected side are interfered with. When this condition exists there may be other evidences of syphilis, either in the form of active ulceration, or as cicatrices marking the sites of ulcers which have healed. The inner edge is a favourite site for a superficial syphilitic ulcer, and both ventricular bands may be thus affected. Tubercular ulcers are met with here, though not so frequently as in the epiglottic and ary-epiglottic folds ; and occasionally the ventricular bands may be greatly increased in size, apart from oedema, as a consequence of tubercular deposit. Polypi may be found springing from those bands, and papillomata may also be found on their surface. When epithelioma occurs within the larynx the ventricular bands are, in the majority of cases, first affected.

The vocal cords are next examined, and these, from their importance, call for the most careful scrutiny. Any alteration in colour or form, and any change, irregularity, or inequality in their movements must be carefully noted; as what in other situations might be considered a trivial deviation from the normal, may not only inter-

fere markedly with the function of the cords, but may indicate an early stage of some serious disease where treatment, to be successful, must be inaugurated at the earliest possible moment.

As has already been noticed, the vocal cords may become injected where hyperaemia of the lining membrane of the larynx, from any cause, exists. When so affected, the vocal bands appear red and rounded, in place of being white and flat. This injection, which is at first general, may become limited in extent, affecting, it may be, one vocal cord or a particular portion of one or both; and this persistent localised hyperaemia is most frequently met with in those who, while suffering from laryngeal catarrh, continue to use the voice, as in teaching, etc. A red and white mottled or patchy appearance of the cords is sometimes observed in syphilitic hyperaemia of the larynx. Under the name of *chorditis tuberosa* or *trachoma*, TÜRCK of Vienna described a roughened condition of the surface of the cords resulting from the persistent use of the voice while the speaker or singer is suffering from laryngitis. It is a very chronic condition, is not uncommon, and from interference with the voice it is a constant source of annoyance to the patient. Ulcers occur at various parts of the cords and under varying conditions. They may appear as small and circular sores on any part of the surface of one or both; or they may be met with along the free edge, and from the consequent destruction of tissue the edge of the affected cord becomes irregular in outline, or it may be regularly irregular like the edge of a saw. These ulcers may be the result of syphilis or tuberculosis. In the former the destruction is usually more extensive and the sores less painful than when of the latter character, but differentiation will chiefly depend on the evidences of disease found in other parts of the

larynx, in the chest, and elsewhere. In a syphilitic case recently under my care, the edges of both ventricular bands and of both vocal cords were eroded, so that in the same case and at the same time there was a double line of ulceration on each side of the glottis.

As a result of ulceration, one or both vocal cords may be destroyed in great part or entirely. Care must be taken to differentiate between actual absence of a vocal cord, and inability on the observer's part to see it, from, perhaps, swelling of a ventricular band.

New growths of a benign character may be met springing from the cords and appearing as projections on the mucous membrane. They are usually in the form of small polypi, often surrounded by an injected area, and they most commonly occur as a result of chronic inflammation. They always interfere with the voice, the degree of interference being determined by the size and position of the polypi. A very small one springing from the edge of one of the cords may, by preventing their complete approximation, produce marked huskiness or even aphonia; and, when larger in size, and especially when the pedicle is so long as to allow of free movement of the new growth, dyspnoea, sometimes of an alarming character, may be complained of. Papillomata are the most common of the benign growths affecting the cords. They are sessile, and usually of a greyish-white colour. Fibromata and mucous polypi are both pedunculated, rounded and smooth on the surface, and bright red in colour.

Of malignant growths which attack the cords epithelioma is the most common, and it may here occur either primarily, or secondarily to disease in neighbouring parts. Epithelioma of the cord may appear as a nodule, changing but little in appearance for a time; but as a rule it soon

ulcerates, the ulcer having ragged edges and its surface being coated with pus.

During a laryngoscopic examination, it is of the utmost importance to note the **movements of the vocal cords** to see whether they are widely separated and equally so during deep inspiration, and if they approach the middle line equally and throughout their length during vocalisation. These movements may be disturbed from mechanical causes, as already indicated, or from nerve lesions producing paralysis. This paralysis may be partial or complete, unilateral or bilateral; it may result from central causes, or from interference with the nerves in their course. When muscular action is defective, but not entirely abolished, the term *paresis* is employed; *paralysis* when it is in complete abeyance.

The intrinsic muscles of the larynx derive their nervous supply from the recurrent laryngeal nerves—right and left—and are divided into two main groups, namely, the abductors or openers, and the adductors or closers, of the glottis.

Interference with the laryngeal nerves may either be in the form of *irritation*, or of *pressure*. The former produces spasm, which is usually confined to muscles on the side irritated, though it may affect all the intrinsic muscles, and if the adductors be specially involved, stridulous breathing and even suffocation may result. Laryngismus stridulus, or false croup, is of this nature.

Bilateral paralysis from central lesions are rarely of serious significance, the majority of such cases being hysterical. In the latter the adductor muscles are affected, and respiration is unimpeded, but as the vocal cords do not approximate during attempted vocalisation, aphonia results. On examination the cords may be seen to occupy the position of quiet respiration; but should the patient

cough they become approximated, and the resulting cough is phonetic. In complete paralysis from a serious central nerve lesion, the cords may be widely separated, and there is no attempt at their approximation during efforts at vocalisation.

Paresis or paralysis from pressure exerted on the recurrent laryngeal nerves during some part of their course, is, in the great majority of cases, unilateral, though it occasionally becomes bilateral. It usually results from aneurism of the arch of the aorta, and occurs most frequently on the left side. The reason for this is to be found in the difference in the relations of the two recurrent nerves. The left arises more deeply in the chest than the right, below the arch of the aorta, and is thus more exposed to pressure. The other causes which give rise to paralysis from pressure are tumours and enlarged glands in the mediastinum, cancer of the oesophagus, and tumours in the neck, especially those of a malignant nature.

In bilateral paralysis of the abductors, voice is but slightly interfered with, but inspiration is impeded, and that in proportion to the completeness of the paralysis. On examination the vocal cords will be seen either in the position of quiet respiration, or, if the paralysis is complete, they will be observed close together, if not actually in contact. This condition, which is extremely rare, I have seen in a case where both recurrent nerves were pressed upon by a malignant tumour of the thyroid.

When unilateral paralysis from pressure on a recurrent nerve exists, the fibres of the nerve supplying the abductor muscles are more frequently affected than those supplying the adductors. Under these circumstances the paralysed cord remains fixed near the middle line in the cadaveric position, *i.e.*, midway between abduction and adduction.

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During attempted phonation the sound cord approaches, and in some cases crosses, the middle line to meet its paralysed neighbour; the voice is rough, and is produced at the expense of considerable effort on the patient's part; and the cough is "brassy" in character. This form of paralysis is most frequently associated with aneurism of the arch of the aorta, and the paralysis may be present and easily observed long before any other sign of aneurism can be detected.

When pressure results simply in paresis, the vocal cord on the affected side may approximate its fellow during phonation, but it moves more sluggishly and becomes more readily exhausted, so that after a time its movements are slower and less perfect.

Other conditions due to interference with the innervation of the parts, such as stammering, spasm, and chorea of the vocal cords, are described in the chapter on neuroses of the larynx, where diagrams illustrative of many of these paralyses will also be found.

While using the laryngeal mirror, if the patient inspires deeply, the anterior wall of the larynx beneath the level of the vocal cords, and the trachea, even to its division into right and left bronchi, may be clearly seen. The appearance of these parts when healthy has already been described. In chronic laryngitis, the lining membrane of the larynx below the glottis may be deeply injected, or it may be hypertrophied as a result of the continued inflammation. Of more importance, as it is more common and more dangerous to life, is oedema of the parts beneath the cords—subglottic oedema—first described by Dr. Gibb in his *Diseases of the Throat and Windpipe* (London, 1864). It is frequently associated with acute laryngitis; some later authorities consider it to be closely associated with the gouty diathesis, and in children it may appear

suddenly after exposure to cold, resulting in symptoms referred to as "false croup." On examination the swollen infiltrated submucous tissue is seen as a red rounded projection beneath the vocal cords. The sudden and severe dyspnoea which it occasions, necessitates, in some cases, the performance of tracheotomy, or intubation of the larynx for its relief.

CHAPTER I.

CATARRH OF THE FAUCES AND PHARYNX.

CATARRHAL inflammation of the mucous membrane of the fauces and pharynx is of common occurrence in this country, and affects both young and old.

There are many conditions which predispose to such an attack, but they may be roughly included under the description of "anything which tends to lower the vital powers"; and the exciting cause is usually to be found in any sudden rise or fall in the temperature, especially when associated with dampness of the atmosphere. It is not always caused, as is frequently supposed, by a sudden fall in the temperature, as "summer colds" are frequently the result of the sudden appearance of a "hot wave."

Symptoms.—The earliest symptoms may be a hot, dry feeling, associated with a tickling sensation in the eyes or nose, or at the back of the throat. No matter where it begins it always tends to spread. If it originates on the pharyngeal wall it may spread upwards towards the nose, and towards and along the Eustachian tubes, and it may even extend to and affect the lining membrane of the middle ear. Thus, pain in one or both ears, accompanied by deafness, may be associated with this condition. On the other hand, the inflammatory process

may extend downwards, affecting the whole of the pharynx, the larynx, the trachea, and bronchi, resulting, it may be, in a sharp attack of bronchitis. (When the inflammatory process is confined to the nose it is termed coryza or *rhinitis;* to the fauces, *faucitis;* to the pharynx, *pharyngitis;* to the larynx, *laryngitis,* and to the trachea, *tracheitis.*) There is redness, swelling, and dryness of the surface affected. Thus the nose may be obstructed, the fauces and pharynx swollen and uncomfortable, and sometimes there may even be pain and difficulty in swallowing, in breathing, and in speaking. The redness is uniform, affecting the palate, the fauces, and the buccal pharynx alike. The swelling of the mucous membrane is also general, but the tonsils and uvula are frequently specially involved, when there is enlargement of the tonsils and enlargement and elongation of the uvula. The temperature in the earlier stage is usually increased by one or two degrees. Within a variable time the dry stage is followed by a condition the chief feature of which is copious secretion. The secretion, at first watery or viscid in character, becomes muco-purulent as the inflammatory process subsides.

Diagnosis.—A bright and general injection of the mucous membrane of the palate, fauces, and pharynx, is met with as an early symptom of scarlet fever; as one of the first manifestations of constitutional syphilis, and as a result of the excessive imbibition of alcohol. Before concluding then that this condition is of a simple catarrhal character it is well to "check" the diagnosis by considering the patient's age, by inquiring into his habits, and by searching for corroborative evidence which, whether positive or negative in character, is equally important.

Prognosis.—Under favourable conditions, and in a

healthy patient, resolution takes place within a few days, and by the end of two or three weeks, at most, the parts have resumed their normal appearance. When, however, the patient is in low health, or placed in unhealthy surroundings, it may terminate in a chronic condition—in thickening and relaxation of the mucous membrane affected.

Treatment.—When the condition is acute it is advisable to insist on the patient's remaining indoors, if not actually in bed. He should have warm diluent drinks administered, and light farinaceous diet. The discomfort in the throat may be relieved by a wet compress over the neck: and during the dry stage the inhalation of steam, alone or impregnated with some volatile sedative, is soothing, and when it does not cut short the attack it hastens the second stage. Small doses of Tinct. opii (8–10 minims) begun early, and repeated, occasionally check, and always shorten the duration of the attack. When the temperature is high it is well to begin treatment with a saline purgative and follow with a diaphoretic, such as 12–15 grs. of Dover's powder, with 3–5 grs. of nitrate of potash; or, what in the majority of cases is more efficacious, tincture of aconite, given as recommended by Dr. Sidney Ringer, in doses of 1 minim every hour. The patient must, during the administration of aconite, be confined to bed. This acts locally in allaying the hyperaemia as well as in rapidly reducing the accompanying fever. When the parts are highly inflamed the act of gargling is painful, so that gargling should not be recommended; but a weak astringent or sedative gargle may be prescribed to be used as a mouth-wash. Cocaine, in the form of lozenge, and combined with a sialogogue such as chlorate of potash, is frequently of great service. By such a combination pain is relieved and the inflamed surface is kept clean.

CHRONIC CATARRH OF THE FAUCES, OR RELAXED SORE THROAT.

Chronic catarrh of the fauces may occur as a result of one or more attacks of acute catarrh; or it may appear independently, as for example, from disorders of digestion, exposure to rapid changes in temperature, to night air, or to noxious vapours.

Symptoms.—Pain is seldom complained of, and when present it is of an indefinite character. A frequent tickling cough, the irritation being confined to the back of the throat, hawking of tenacious mucus, and a feeling of dryness in the throat, especially on waking in the morning, are the symptoms complained of by the sufferer. The relaxed uvula which, by irritation of the tongue and fauces, is the chief cause of the troublesome cough, may, by irritating the pharynx, cause retching or actual sickness, and sometimes it even produces spasm of the larynx. This latter usually occurs during sleep, and is caused by the sucking-in of the elongated uvula into the larynx during inspiration.

On examination the fauces and pharynx are seen to be pale, with the engorged vessels coursing irregularly over the surface. The parts generally are thickened, and the uvula elongated and relaxed. If there is much hypertrophy, the enlarged uvula may be club-shaped, but where the mucous membrane is alone involved it tapers to a fine point. When the mouth is at first opened the uvula may be drawn up and its relaxed condition, as a consequence, overlooked; but by having the patient continue to breathe quietly with the mouth open, the uvula gradually descends till its extremity rests on the tongue. A similar relaxed state of the palate and uvula is met with when there is paralysis of the palate, a condition usually occurring as a sequel to diphtheria. Here there is no puckering up of the uvula when

the patient first opens the mouth for inspection, and if the parts are touched, reflex sensibility is seen to be abolished.

Treatment.—General tonic treatment is called for in the majority of cases. It may be in the form of dry bracing air, or of medicinal preparations, chief amongst which are iron and quinine with bitter infusions, and saline aperients when necessary.

Local treatment is invariably required. Where there is much local irritability, treatment may be begun by inhalations of steam, alone or impregnated with some volatile sedative such as camphor or compound tincture of benzoin, both of which are stimulating as well as sedative in their action. After venous congestion and the accompanying pain or uneasiness have been lessened by such means, mild local astringents are necessary, and they are most readily and most pleasantly employed in the form of lozenge. Rhatany pastilles, with or without cocaine, such as made by Allen and Hanburys, or the Rhatany, Catechu or Kino lozenges of the London Throat Hospital Pharmacopoeia will be found useful.

When there is hypertrophy and elongation of the uvula it is necessary to remove a portion of it. Complete removal is advised by some authorities, but removal of a portion—about half or two-thirds of the elongated organ—is to be preferred. The operation may be performed by the aid of a uvulatome, similar in principle to the tonsillotome, or with a bistoury, or with scissors curved on the flat, and forceps. The part is anaesthetised with cocaine, the elongated uvula is grasped near its extremity with a pair of long-toothed forceps, by which it is pulled downwards and somewhat forwards, and so kept on the stretch. The lower portion is then cut away, if with scissors, from before backwards and upwards, if with a bistoury, from behind forwards and

downwards, so that the resulting raw surface will be directed towards the pharyngeal wall. Cut thus, the raw surface is protected from irritation during deglutition. If on the other hand it is cut straight across, by accident or through ignorance, the whole of the lower surface is raw, and is consequently fretted by everything which the patient attempts to swallow. After the operation fluid food should be recommended, and demulcent lozenges, such as those of marsh-mallow, or the use of an antiseptic mouth-wash, add to the patient's comfort, and hasten the healing process.

CHAPTER II.

AFFECTIONS OF THE TONSILS.

ACUTE TONSILLITIS, OR QUINSY—ACUTE INFLAMMATION OF THE FAUCIAL TONSILS.

ACUTE inflammation of the tonsils is, for purposes of description, and according to the severity of the process, divided into several varieties. (1) When the mucous membrane alone is involved, as occurs in acute inflammation of the fauces and pharynx, already described, tonsillitis is met with in its simplest form; and this, as it is confined to the mucous covering, is known as **superficial tonsillitis.** (2) Secondly, the inflammatory process may specially affect, or may even be confined to, the crypts or follicles, of which there are from twelve to fifteen in each tonsil, when it is termed **follicular** or **lacunar tonsillitis.** (3) Thirdly, the inflammation may affect the gland structure or tonsil-tissue proper, in which case it is named **parenchymatous tonsillitis.** This latter form may end in suppuration, giving rise to abscess of the tonsil. (4) The loose connective tissue around the tonsil is frequently implicated during the course of a parenchymatous tonsillitis, and the **peritonsillitis,** as it is called, frequently ends in suppuration, especially when the patient is in low health. The pus is outside the tonsil, and when allowed to burst it may escape between the anterior pillar and the tonsil, or between the

posterior pillar and the tonsil, though it not infrequently makes its way through the anterior pillar.

Causes.—There are certain conditions which predispose to acute imflammation of the tonsil, chief amongst which may be mentioned age (it occurs most frequently in young adults), heredity, the rheumatic and strumous diatheses. One attack predisposes to a second; and it is most common in those who have chronic enlargement of the tonsils.

Exposure to cold and damp is the usual exciting cause, and the follicular form may alternate with or precede an attack of acute rheumatism.

Symptoms and Appearance on Examination.—The **symptoms** vary according to the severity of the inflammation. In the superficial form, when there is slight fulness of the tonsils with redness of their surface, discomfort, amounting in some cases to sharp pain on deglutition, is the sufferer's chief complaint. In follicular tonsillitis there may be slight or considerable enlargement of the tonsil, and the surface of one or both is studded with greyish-white spots, which consist of the increased secretion, with epithelial *débris* retained in, and showing at the openings of, the follicles. This condition may be only slightly painful, the discomfort being principally owing to the size of the inflamed tonsils, or it may be acutely painful, with subjective symptoms similar to those met with in parenchymatous tonsillitis. The symptoms of the latter form are frequently very severe and ushered in with a rigor and high temperature.

Deglutition is painful and difficult, sometimes impossible, and during the act sharp pains shoot up towards the ears. Occasionally when fluids are being swallowed, a portion returns by the nose, as the nasal cavity, from the swelling of the tonsils and parts around, is not completely shut off from the buccal cavity during the act of deglutition.

Respiration is interfered with, and in some few cases the interference is so great as to threaten suffocation, in which cases tracheotomy is necessary for relief of breathing.

Speech is thick, articulation difficult, and voice lacks nasal resonance.

There is frequently dulness in hearing, from the walls of the Eustachian tubes and the tympani being implicated in the inflammatory process. There is difficulty in opening the mouth; sometimes it is impossible to separate the lower teeth from the upper on account of the inflammation and swelling of the parts around the tonsils and in the neighbourhood of the condyles. The tongue is thickly furred, and the fauces coated with tenacious mucus. When the mouth can be opened and the parts examined, it will usually be observed that one side alone is involved. The tonsil is greatly swollen, rounded in outline, and of a deep livid red colour. The faucial pillars and the palate on the affected side will also be found in a condition of acute inflammation. The tonsil is firm and hard to the touch, and at a later stage fluctuation may be detected at some part of the tonsil, or it may be, as in peri-tonsillitis, around the inflamed gland.

When the second tonsil becomes affected it usually begins to swell and become painful as the inflammation of the one first affected is subsiding; and the implication of the second is marked by a rigor and rise of temperature similar to that which preceded the first attack. It runs a similar course, ending in resolution, in abscess, or in permanent enlargement of the tonsils.

Diagnosis.—There is usually little difficulty in diagnosing acute tonsillitis, but the general faucitis met with as an early manifestation of scarlet fever is apt to be looked upon as tonsillitis in its superficial form and the gravity of the case overlooked. In the latter, however, though the tem-

perature may be high, there is no redness of the tongue, which is usually furred. Again, the follicular spots are sometimes taken for ulcers, and in cases in which the white spots are few in number, or the secretion profuse, follicular tonsillitis is frequently mistaken for diphtheria. In the differentiation between follicular tonsillitis and diphtheria the most experienced are sometimes in doubt. As a rule the temperature in follicular tonsillitis is high and frequently out of all proportion to the constitutional disturbance, which is often very slight and sometimes conspicuous by its absence. Sometimes the secretion exudes from the mouths of the crypts, and coming in contact with that from neighbouring follicles, covers a considerable part of the surface of the tonsil. This may readily be mistaken for the membranous exudation of diphtheria; but it is soft and friable, there is no continuous membrane, as can be shown by passing a probe through it between any two given follicles; and this exudation can readily be removed by a brush or cotton swab without leaving any abrasion of the surface beneath. Pain in follicular tonsillitis varies, and when the condition is subacute it may be absent, but in diphtheria pain in the tonsil is seldom complained of. The glands at the angle of the jaw are frequently involved in diphtheria and may be tender to touch, a condition only occasionally associated with follicular tonsillitis. And lastly, the presence or absence of albumen in the urine will aid in determining the diagnosis.

Prognosis.—Although the symptoms associated with acute tonsillitis in its severer forms are alarming, the prognosis is almost always favourable. In superficial and in follicular tonsillitis resolution under ordinary circumstances takes place within three to five days, and these forms seldom, if ever, go on to suppuration. In parenchymatous tonsillitis, and when suppuration occurs in or around the

tonsil, its course is seldom short of ten days, and occasionally three to four weeks pass before the inflammatory process has quite subsided. The affected tonsil after an attack of acute inflammation may remain permanently enlarged, and a liability to recurrence of similar attacks is established.

Treatment.—In superficial tonsillitis treatment is conducted on the lines laid down for the treatment of acute faucitis. Similar treatment—confinement to bed, regulation of the bowels by the use of salines, light diet and soothing inhalations—should be adopted in the follicular form; and in addition, when the condition is associated with pains throughout the body of a rheumatic character, the use of salicylic acid or salicylate of soda will be found of considerable service. When it occurs in those with marked rheumatic tendencies the alkalies in full doses may be substituted.

Parenchymatous tonsillitis is frequently associated with disordered digestion, with a thickly furred tongue, and foul-smelling breath. When this is the case much relief, both local and general, may be obtained from the use of a sharp emetic, such as a solution of salt, or ipecacuanha with zinc sulphate; and should the local inflammation not be reduced by this means, the general temperature is frequently lowered. (An emetic was recommended by the older practitioners in the later stages, when suppuration had occurred, as a method of evacuating the abscess.) In place of an emetic, treatment may be begun by the administration of a sharp purge. The exhibition of these should be followed by the administration of one or other of those drugs which experience has shown to have some, if not a specific, action in allaying tonsillar inflammation. Aconite used in the form of tincture is one of them, and it should be administered in minim doses hourly, its action on the heart being carefully watched the while. In addition, it may be

applied locally, as first recommended by Dr. Prosser James, combined with glycerine or water, and painted over the inflamed surface with a hair pencil. If the three constituents of the mixture, tinct. aconite, glycerine, and water, are in equal proportions, the quantity carried by a medium sized hair pencil will contain close on three minims of the tincture.

Guaiacum is preferred by others. It has been strongly recommended by the late Sir Thomas Watson, and more recently and very strongly by the late Sir Morell Mackenzie, who prescribed the resin in the form of lozenge, made, according to the Pharmacopoeia of the London Throat Hospital, with black-currant paste. Each lozenge contains from 2 to 3 grains of the resin, and it is recommended to take one every two hours. Should the lozenges tend to nauseate, the mistura guaiaci B.P. may be substituted, and in many cases its beneficial action is of a satisfactory character. It is, however, worse than useless to prescribe guaiacum where the tonsil is much swollen and highly inflamed. When in that condition the surface of the tonsil may be brushed over with a strong solution of nitrate of silver (30 grs.—ʒj), which occasionally checks the inflammation and is to be preferred to solution of chloride of zinc; and the sucking of ice at this stage is often comforting.

Scarification of the surface of the inflamed tonsil, as advised by some, should never be practised. It adds to the patient's sufferings, may cause ulceration, and it seldom if ever affords any relief.

When not checked in the earlier stage, the inflammation usually goes on to suppuration, so that if the affected tonsil remains deeply injected, swollen, and painful beyond the third day, treatment should be directed towards encouraging and hastening suppuration. To this end hot

fomentations or hot poultices should be applied over the neck, or where this cannot be tolerated, the neck on the affected side should be covered with a thick pad of cotton wool. Hot moist inhalations, such as steam, alone or impregnated with some volatile sedative—hops, conium, or compound tincture of benzoin—should be used for three to five minutes several times a day. The mouth should be rinsed with hot water or a solution of borax, boracic acid, or chlorate of potash in warm water.

When fluctuation can be detected, the abscess, whether in the tonsil or around it, should be opened. For this purpose a bistoury, set on a long handle, is employed, and the tongue is kept on the floor of the mouth by the use of a depressor. If the abscess is *in* the tonsil, the incision should be directed inwards and upwards or downwards, that is towards the middle line. When the abscess is outside of the tonsil it is evacuated through the anterior pillar by an opening made in a line with the edge of the pillar. Being thus between the fibres of the palato-glossus muscle, the edges of the incision may come together before the abscess is completely evacuated, but by the insertion of a pair of dressing forceps and separation of the blades it is readily emptied. This operation should be followed by the use of a warm antiseptic mouth-wash. The pus is always foul-smelling. When the inflammatory process has been severe, and especially in weakly patients, ulceration or gangrene of a portion of the tonsil may result.

CHRONIC TONSILLITIS. ENLARGED TONSILS.

Enlargement of the tonsils, which, as pointed out by Virchow, is a true hypertrophy of the lymphadenoid tissue, may be congenital, or may result from a solitary

attack, or from repeated attacks of inflammation, follicular or parenchymatous.

It is most frequently met with amongst children, usually as a manifestation of the strumous diathesis, though it may for the first time appear at puberty, and Dr. Prosser James, in 1859, drew attention to cases in females where affections of the tonsils were associated with the active development of the reproductive organs or with ovarian activity.

The **symptoms**, on account of which attention is called to the child's condition, are many, and of considerable importance. They may be summed up thus:—Interference with respiration; thick toneless voice; disturbed sleep; dulness in hearing; difficulty in deglutition. Some of these may be more marked than others, but where both tonsils are much enlarged, all those symptoms may be present.

Interference with respiration, which is the most serious in its consequences, is mechanical in character. The enlargement of the tonsil on either side, by narrowing the isthmus of the fauces, impedes buccal respiration, and nasal respiration is also interfered with partly by the presence of the enlarged tonsils, but also from hypertrophy of the glandular tissue in the walls of the pharyngo-nasal space, a condition frequently associated with hypertrophy of the faucial tonsils. When the child is at rest, respiration is harsh, noisy, and often irregular; during exertion it is laboured; while during sleep it is accompanied by a snoring noise, and from the difficulty then experienced in breathing, sound refreshing sleep is in many cases impossible. Children thus affected breathe constantly by the mouth, which necessarily remains open, and from this cause, as was pointed out by Dr. Felix Semon, the development of the nostrils is arrested from want of use. The resulting

appearance of the face is characteristic : face elongated, with narrow nose, prominent upper lip, and open mouth ; and these features are exaggerated when the pharyngeal tonsil is similarly hypertrophied. When the hypertrophy is congenital there is sometimes difficulty experienced in suckling a child so affected from its inability to breathe through the nose while at the breast. In such also the development of the chest may be seriously interfered with, and "pigeon-breast," that is flattening, from falling in of the chest wall on either side, and sometimes to an extreme degree, may result from the interference with the supply of air to the lungs. Speech is thick, owing to interference with the movements of the tongue and palate from the swellings at the back of the mouth, and voice lacks tone as the pharyngeal and nasal cavities are so encroached upon as to prevent their being of use as resonators.

Dulness in hearing, which is frequently associated with enlarged tonsils, is sometimes the chief complaint on account of which advice is sought. This deafness does not arise from pressure upon and blocking of the pharyngeal opening of the Eustachian tube by the enlarged tonsil as is sometimes stated, but it is due to a narrowing of the calibre, or to actual closure, of the tube by hypertrophy of its lining mucous membrane, which, beginning as a chronic pharyngitis, spreads upwards towards the tympanum.

Difficulty in deglutition varies with the size of the tonsils and with their condition, *i.e.*, whether inflamed or not.

Diagnosis.—When examined there is no difficulty in recognising the condition, though the tonsils vary in appearance. They may occur as large, smooth, globular swellings, or the surface may be rough and studded with depressions—"honey-combed"; and there may be a considerable space between them, or they may meet and lie in contact in the middle line. Again, it may be observed that

in place of the enlarged tonsil standing boldly out from between the pillars, the anterior pillar is stretched over it,

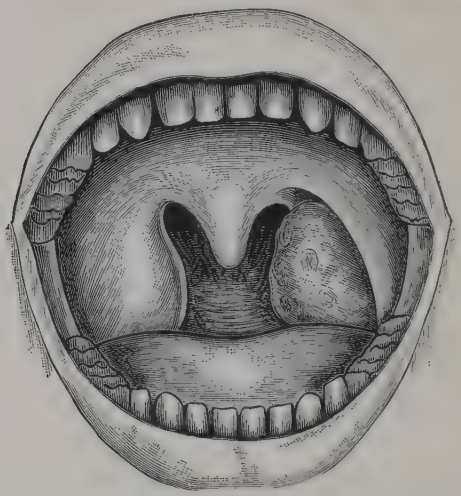


FIG. 12.—Chronic enlargement of both tonsils. On the right side the anterior pillar is adherent to and completely covers the front of the tonsil; on the left the hypertrophied gland stands out free of the pillars, and over its surface are several dilated lacunar openings.

entirely covering its anterior aspect, and so intimately connected with it as to virtually form part of the tonsil.

Prognosis.—When the enlargement is congenital, or when the tonsils become enlarged from any cause in childhood, they persist as a rule and tend to increase in size. It may be that they give but slight inconvenience throughout the greater part of each year, but they are liable to become acutely inflamed at any time (this usually occurring in spring and in autumn), when the resulting symptoms are those of acute tonsillitis. They sometimes disappear spontaneously at puberty, and this fact is frequently used by parents as an argument against operative interference. It must be remembered, however, that when puberty is

reached they may not disappear—in fact it is the exception for them to do so—and in the interval the child suffers considerably each time the tonsils are inflamed; speech is thick; hearing may be permanently impaired; the chest, though perhaps not deformed, will not be fully developed; and the general health will have suffered more or less according to the size of the tonsils and the frequency with which they have been inflamed. During an epidemic of diphtheria, again, those children who possess enlarged tonsils are more liable to be affected than those whose tonsils are normal in size.

Treatment.—The treatment adopted in chronic tonsillitis must be constitutional as well as local. The former, when the patient is a child, may be summed up in the administration of cod-liver oil along with iron, preferably in the form of *Liquor ferri perchloridi;* no tea, a plentiful supply of easily digested, nourishing food, careful clothing, and exercise in the open air. In adults general tonic treatment is also usually necessary.

Local treatment consists of chemical applications and of operative measures. Astringent gargles and painting the surface of the tonsil with such astringent preparations as glycerine of tannin, and solutions of iron in glycerine or water, are frequently recommended, but their use in the majority of cases is to be deprecated. On account of their astringency they may somewhat lessen the bulk of the tonsil, but they seldom, if ever, reduce the hypertrophy of tissue, and at best their effect is temporary.

Tincture of iodine painted over the surface may, when the tonsil is very flabby, lessen its size somewhat, but the application of iodine externally, apart from the comfort which a parent "may derive from the sight of a yellow stain upon the child's neck," as Dr. Edmund Owen puts it, is of no use whatever.

Injections of tincture of iodine, of acetic acid, etc., into the substance of the tonsil have been recommended, and electrolysis has also been practised.

Nitrate of silver, Vienna paste, chromic acid, and other caustics have been employed for the destruction of hypertrophic tonsils, and Sir M. Mackenzie strongly recommended a mixture of caustic soda and unslaked lime in equal parts, which, when mixed with water, is known as London paste. Of it, he wrote, that its use "in many cases precluded the necessity for excision." It should be mixed with water only when about to be used and applied to the tonsil with a spatula. It causes a slough of the portion to which it is applied, and by repeated applications the size of the tonsil is greatly reduced. It is a slow and painful method, and since the introduction of the galvano-cautery has almost entirely gone out of use.

Operative measures may be divided into (1) destruction of a portion of the tonsil by means of the cautery—galvano-puncture; (2) amputation of a portion by écraseur, snare, bistoury, or tonsillotome; (3) removal of the whole tonsil by enucleation.

1. In the use of the galvano-cautery for the destruction of a portion of the gland, the tonsil should first be anaesthetised by rubbing it well with a swab soaked in a 20 per cent. solution of cocaine. When sensation is abolished, the surface of the tonsil should be punctured by the cautery at several points. The tissue thus destroyed sloughs, and cicatrisation, and consequent reduction in the size of the tonsil, results. This method is specially useful where the pillars so blend with the tonsil as to preclude amputation.

2. In the removal of a portion of the tonsil, the écraseur, as used by Chassaignac, and by many surgeons since, may be employed. The cold snare is used by some, and the

galvano-caustic snare by others, on the ground that by such means there is no risk of haemorrhage after the operation. The majority of operators, however, prefer to cut the tonsil, either by the use of the bistoury or with some form of tonsillotome. When the bistoury is chosen, the tonsil is grasped with vulsellum forceps, by which it is drawn well towards the middle line, when, with the bistoury, which should be straight (though some prefer a curved blade) and probe-pointed, it is removed close to the border of the anterior pillar.

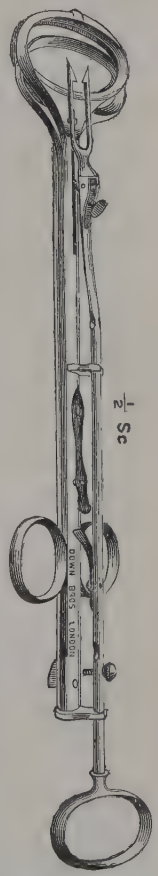


FIG. 13.—Fahnestock's guillotine.

The tonsillotome is, however, the instrument most commonly employed, as it is, in all ordinary cases, thoroughly satisfactory. There are two distinct types of such instruments, namely, the ring-guillotine, which cuts from behind forwards, and the spade tonsillotome, which cuts from before backwards. The former is the invention of Fahnestock of Philadelphia, and is so arranged that when the tonsil is encircled by the ring it is transfixed by a barbed fork, which drags it towards the middle line, before the knife is released. When released, the knife, which is pulled by the fore and middle fingers, cuts through the tonsil. Its delicate mechanism is one of its drawbacks. When, as is frequently the case, the fork is of soft metal, in place of pulling the tonsil through the ring the fork may curve deeply into the substance of the tonsil and lock with the blade as the latter cuts into

the tonsil. Again, with this form one cannot gauge the proportion of tonsil which may be removed. A tonsil free from adhesions to the pillar, may be completely excised, while in other cases, the fork, in place of dragging the tonsil into the ring, may simply tear through the tissue, and little more than mucous membrane is removed by the knife.

By the use of the spade tonsillotome (which, as now employed, is Mackenzie's modification of the instrument invented by Physick, who, like Fahnestock, was a Philadelphian) much or little of the tonsil may be removed

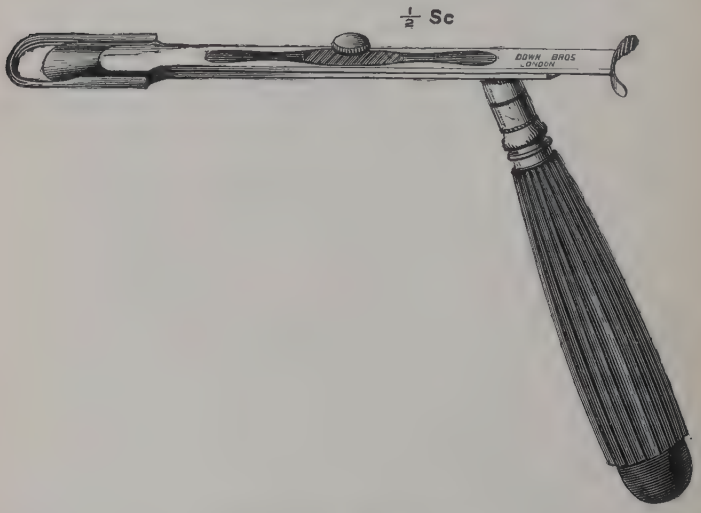


Fig. 14.—Physick's tonsillotome.

as desired. In its use it is necessary to have a skilled assistant, who, standing behind the patient, so places a hand on either side of the patient's head as not only to hold the head still, but with the middle finger on the neck to fix the tonsil about to be amputated. Thus

fixed, the tonsil is encircled by the ring of the instrument, which, in cutting the right tonsil, should be held in the left hand, and in the right hand, when operating upon the left tonsil. With the ring around the tonsil, the instrument is pressed firmly outwards against the fixed point—the assistant's middle finger—and the blade is then sent home by the pressure of the thumb of the hand which holds the tonsillotome, or, and preferably, by the thumb of the free hand.

Enucleation of the tonsil, an operation practised by the ancients, and re-introduced to the notice of the profession at intervals, is performed by means of the index finger. The finger is passed well round the enlarged gland, and its attachments separated by means of the finger nail. When I have performed this operation intentionally the patients have been anaesthetised, and, with the mouth gagged, the tonsil was readily removed. Twice, during the past eight years, I have performed enucleation by accident—once in private and once in hospital, the latter being in the presence of several students. Both patients were girls about twelve years of age. In each case the tonsil was within the ring of the tonsillotome (Fahnestock's), was transfixed with the fork and the blade entering it, when suddenly the child raised the hands, caught hold of the instrument, and violently wrenched it from the mouth, bringing with it in each case the entire tonsil. In neither case was there any untoward result.

Complications following Operative Procedures.—Of the complications which may follow removal of a portion or of the whole tonsil, inflammation, haemorrhage, and septic infection are the chief.

1. After the use of the galvano-cautery, whether applied for puncture or as a snare, the surrounding parts become inflamed, and occasionally the inflammation spreads to

the pharynx, from which it may extend to the Eustachian tubes, and, passing upwards, implicate the middle ear.

The employment of a warm antiseptic gargle (*see* Gargles) along with the use of marsh-mallow lozenges, following the operation, will, as a rule, prevent the appearance of any serious inflammation, and these means will do much to relieve it when it has appeared. Where pain is a marked symptom, cocaine pastilles may, in addition, be employed with much benefit.

2. When a portion of a tonsil has been removed by a cutting operation haemorrhage necessarily follows, but as a rule the quantity of blood lost is trivial, and the bleeding usually ceases spontaneously. Immediately following the operation cold water should be given to the patient, of which, after cleansing the mouth, some should be sipped, as the act of deglutition is of material service in causing contraction of the cut vessels. If it is thought necessary an astringent may be added to the water, the most useful for such a purpose being a mixture of three parts tannic acid with one of gallic acid (London Throat Hospital Pharmacopoeia), which, when mixed with the water, should be sipped. By such means, in the great majority of cases, bleeding ceases entirely within a very few minutes, though occasionally a case may be met with where, notwithstanding those measures, haemorrhage persists, or, having been checked, bleeding recurs. In illustration I would briefly refer to a case which occurred in my hands, details of which were published in the *Edinburgh Medical Journal* for August, 1886. The patient was 34 years of age. When a lad he had acute tonsillitis, going on to suppuration, and this had recurred since with almost unfailing regularity to his very great discomfort. Both tonsils were enlarged, and after a course of iron I recommended abscission. Both were removed, the larger, the right,

by Physick's tonsillotome, the smaller, as it was irregularly enlarged, with the bistoury. The amount of blood lost at the operation was perhaps somewhat more than is usual, but after the free use of the acid solution which the patient sipped, it seemed entirely checked at the end of fifteen minutes. Six hours afterwards I was summoned to see the patient. I then learned that for four hours after the operation the slight pain consequent on tonsillotomy was all that reminded him of the removal of the glands. At that time he went to stool where, his bowels being constipated, he strained rather severely, and while doing so he felt a tickling on the right side of the throat. This necessitated the frequent clearing of his throat, and on coming to the light he discovered that his expectoration was bright red, resembling pure blood. The cut surfaces were examined by me but no bleeding point could be discovered, so astringents were applied, followed by the use of ice and the internal administration of ergot. Bleeding ceased for a time but re-appeared, to be again checked by astringents and pressure; and these recurrences were so frequently repeated that the patient became blanched, and on attempting to sit upright fell back in a faint. Before attempting to ligature the carotid, which now seemed to be indicated, the actual cautery was applied over the cut surface of the right tonsil, the tongue and cheeks being protected the while. This served to completely arrest further bleeding, and with the help of a chalybeate tonic and a plentiful supply of fluid nourishment, he was, at the end of two weeks, able to go to the Highlands.

This complication of a comparatively simple, and in many cases very necessary, operation is very rare, judging from my own experience and from the small number of such cases recorded. In considering its source I would here express my firm conviction that in the operation of ab-

scission of the tonsil, as long as we cut—with bistoury or with guillotine—on the inner side of the line of the faucial pillars it is impossible to injure the internal carotid artery, however abnormal its course may be. This is important, as the very thought of the close proximity of the vessel to the tonsil is a terror to many when called upon to operate. In every reported case which I could find described in detail—and in some of them the common carotid artery was ligatured to check the haemorrhage—in no case was the carotid found to have been injured in the removal of the tonsil. In several of the reported cases of haemorrhage from the tonsil, the tonsil had been *incised*, the incision in all probability going a good way outside the line of the pillars, and yet where death followed ligature of the carotid it was discovered that the haemorrhage had not been due to injury of that vessel. I have been told of a case where an aneurism of the internal carotid was mistaken on a hurried examination for a quinsy, and opened, with an almost immediately fatal result. The ascending pharyngeal artery which lies between the internal carotid and the pharynx might possibly be damaged, but only I think in unwarrantably free incisions into the tonsil, never in cases of abscission pure and simple. Excessive haemorrhage might occur after tonsillotomy in those the subject of haemophilia. Here the cautery applied without delay would be found most efficacious.

The most common cause of serious haemorrhage will be found in the condition of the tonsil itself. Where abscission of the tonsil is called for, that gland is hypertrophied to a marked extent, frequently the result of oft repeated attacks of inflammation of the substance or of the follicles of the organ. During the acute stages of the inflammation hyperaemia is very distinct, leading to a true hypertrophy. In the stage of hyperaemia the vessels are

necessarily increased in diameter, and in order to nourish the resulting hypertrophied gland they become permanently enlarged. To start with, the tonsillar branch (from the internal carotid) may be abnormally large ; but its importance, and therefore its calibre, is added to by the enlargement of the organ to which it supplies blood : the greater the increase in the size of the organ the greater must be the blood supply, and to this end and in the same proportion must the calibre of the artery be increased. This more than usually large vessel then, imbedded in the firm substance of the tonsil, may be unable to contract sufficiently after division, and this may admit of considerable haemorrhage. Such was the cause of bleeding in my case. Haemorrhage was checked over and over again by the formation of a clot at the mouth of the cut vessel. The vessel, however, could not contract on account of the hard firm tissue surrounding it, and the clot was readily displaced.

So far, then, as regards the tonsil itself, if the guillotine be used, the cut surface of the tonsil *should* be the only possible seat of haemorrhage. If, however, the bistoury be employed we introduce a new element of danger. The incision may not be confined to the tonsil, but one or other of the pillars may be scratched or cut, leading to smart haemorrhage, as in a case reported by Billroth (*Lancet*, 1870, vol. ii.) ; or should the bistoury not be probe-pointed, the mucous membrane of the posterior wall of the pharynx may be incised, resulting in troublesome bleeding. Thus to the list of sources may be added those two which I call "extra-tonsillar," in contra-distinction to the possible sources of haemorrhage from the tonsil itself. The question of the occurrence of haemorrhage after tonsillotomy may be fairly summed up thus. The summary is on lines similar to those of Dr. George M. Lefferts of

New York, and published in the *Transactions of the American Laryngological Association*, the modifications being prompted by my own experience and the reported experience of others.

(1) In a large majority of cases no trouble is experienced after the operation of tonsillotomy, the bleeding quickly ceasing either spontaneously or by the use of simple remedies.

(2) A moderate haemorrhage requiring the use of strong astringents or even direct pressure to check it is occasionally met with.

(3) A serious haemorrhage—serious as regards both possible immediate and remote results—is comparatively rare.

(4) A fatal haemorrhage is possible, but *very* rarely occurs.

After-Treatment.—Following the removal of the desired portion of the hypertrophied tonsil, cold water, or better, the tanno-gallic acid mixture, slowly sipped, is sufficient to quickly check any bleeding present in ordinary cases. The latter may be relied on to check even comparatively smart haemorrhage. Should this fail, however, the part should be well swabbed with the strong solution of perchloride of iron, accompanied possibly with its administration internally at short intervals, and should even this, supplemented it may be with pressure over the raw surface, be without effect in checking it, I would not recommend having recourse to other styptics, nor would I attempt to ligature the bleeding point, but at once, in those very exceptional cases, resort to the actual cautery.

3. Should a tonsil be excised during the prevalence of diphtheria in the neighbourhood of the patient's residence, there is considerable risk of that patient contracting the disease. The poison readily gains access to the raw

surface, and when once implanted is quickly absorbed. In a case which came under my observation, the tonsil was removed at a general hospital and the patient straightway after the operation was taken to her home in a neighbouring town, where, as it happened, there were several cases of diphtheria at that time. Three days after the operation the child was found to be suffering from the disease with copious false membrane, and a fatal result occurred within a week.

Occasionally on the second or third day after the operation the cut surface may be found to be covered with a greyish membrane, composed partly of sloughing tissue and partly of fibrinous exudation. This is not to be confused with diphtheria. It is most apt to occur when the patient is weakly and when the child's surroundings are of an unhealthy character. The use of a local stimulant, such as solution of nitrate of silver (40 gr.–ʒj), applied freely to the surface, followed by the frequent use of an antiseptic gargle (Condy's fluid or carbolic acid), will rapidly clean the surface and permit the healing process to terminate satisfactorily. The best medicinal preventive is the regular administration of Liquor ferri perchloridi for some time previous to the operation, and its continuance thereafter until the part is quite healed.

Conditions in which Tonsillotomy is called for.—When the enlargement of one or both tonsils is such as to cause thickness of speech or to interfere with respiration, though it be only to a comparatively slight extent, the hypertrophied gland should be removed. Also where there are repeated attacks of acute inflammation of the tonsil or its follicles, abscission should be recommended as a preventive measure; and in such cases the time most suitable for its removal is when the inflammatory swelling is subsiding.

Remote Results.—When recommending abscission of one or both tonsils the patient, if an adult (or the parents in the case of a child), desires to know if after the operation matters will be right—if the offending part will give no further trouble. To give an evasive reply lessens the confidence of the patient, and yet one cannot in every case make answer with an unqualified affirmative. As the result of inspecting a large number of cases twelve months after removal of one or both tonsils, the following are my conclusions on this point:—In the great majority of cases of chronic enlargement, when the child is fairly healthy and where at least two-thirds of the gland have been removed, the tonsil does not again enlarge, nor does it readily become inflamed. In a small number of cases, when the children have a markedly scrofulous constitution, in whom the tissue of the tonsil is soft and friable, what is left of the gland tends to again increase in size, and occasionally this increase occurs within a very short time after operation. This is especially the case when, on account of urgent symptoms, the operation is performed while the child is under 2 or 3 years of age.

In those more advanced in life, when the tonsil is removed on account of repeated attacks of inflammation, immunity is secured by the majority. In a small number of cases the stump may become inflamed, but when this does occur the attacks are much less frequent, they are much less severe and of considerably shorter duration than those experienced previous to the operation.

In cases of chronic follicular tonsillitis the gland may not be so much increased in size as to demand removal, but the patient in many cases may nevertheless be much annoyed by the persistent presence of hardened secretion retained within one or more of the crypts which have as a consequence become much distended. The secretion

thus met with is white in colour, of the consistence of cheese, and is foul smelling. In most cases it is readily dislodged by pressure, but if removed in this simple fashion the crypt soon becomes refilled. Some recommend after the secretion has been squeezed out, the swabbing of the interior of the crypt with an astringent solution. Hoffman recommends the breaking down of the walls of neighbouring follicles by means of a blunt hook, which admits of the thorough removal of the secretion; but the method which I have found of greatest service, and which I employ regularly in very chronic cases, is to open the affected follicles freely by cutting through their walls with a sharp tenotomy knife, scrape out the retained secretion with a sharp scoop, such as Volkmann's spoon, and cauterise the interior of the hypertrophied crypt.

It happens, though rarely, that the retained secretion cascates, lime salts become deposited in it, and a calculus is formed. This in the majority of cases lies dormant, and in most cases is detected by accident, as for instance when attempting abscission of the enlarged tonsil. But sometimes its presence causes suppuration, which ends in its ejection.

CYSTS OF THE TONSIL.

Small superficial cysts of the tonsil are occasionally met with. Such a cyst may occur on any part of the surface of the tonsil, and is apt to be mistaken for a small abscess, which it resembles, in that it is raised from the surface, the elevated area is yellow in colour, and it is circumscribed. It is not the result of suppuration, and, if not interfered with, will remain unchanged for long periods without causing pain. The contents are more or less fluid, along with small white semi-solid particles which are free from odour, differing thus from

the cheesy accumulation described as occurring in chronic follicular tonsillitis, in which the odour is always offensive.

In addition to this superficial form, which is not uncommon, there is another and much rarer condition, where the **cyst is larger** and situated deeply in the tonsil. Dr. M'Bride, in describing two such cases which had been under his care (*British Medical Journal*, May, 1892), says: "On the affected tonsil was seen a yellowish-white area of considerable size, over which small vessels ramified and an incision in each gave exit to about a drachm of cream-like fluid resembling pus, and without any odour or even bad taste." The only case of this kind which has come under my observation resembled a chronic abscess. There was no pain complained of, only inconvenience from the presence of the enlarged tonsil, in which fluctuation was detected on palpation. Under treatment similar to that to be spoken of, it healed perfectly.

Treatment.—In the superficial form the thin cyst wall should be laid open with a bistoury, and the cyst cleaned out by the use of a sponge on holder. Further treatment is seldom necessary.

In the second form it is advised not only to open the cyst, but to remove a portion of its wall, *i.e.*, to remove a portion of the tonsil, either on its anterior or its inner aspect, and follow with the use of an antiseptic gargle till the part is healed.

MALIGNANT DISEASE OF THE TONSILS.

The tonsils are the seat of **malignant disease** more frequently than is supposed by many, or than might be inferred from references made to the subject by authors. Most of our text-books on general surgery either wholly omit mention of such a condition, or it is but vaguely,

and in a few words, referred to as a possibility. Of reference by specialists to the occurrence of malignant disease in the tonsil, the following quotations may be taken as a fair representation of their views regarding its occurrence. Dr. Prosser James, in his work on *Sore Throat*, p. 242, says that "Cancer very rarely begins in the tonsils, though it spreads to them from neighbouring parts." Dr. Gibb, in his manual of *Diseases of the Throat and Windpipe*, p. 351, says: "If cancer affects the tonsil it is usually by extension from some other part of the throat; but I had the opportunity of examining a case of idiopathic cancer of the left tonsil in a man aged 49 years, in October, 1859, under Dr. Marsden's care, at the Cancer Hospital. It was eaten away by the disease, forming a large excavation in front of the left pillar of the fauces. The disease was hereditary in him. Cancer commencing in the tonsil primarily is a very rare affection." Sir Morell Mackenzie, in his work on *Diseases of the Throat*, vol. i., p. 83, remarks that "Cancer of the tonsil is a rare disease," and that "most of the reported instances belonged to the encephaloid variety." Mr. Lennox Browne, in his *Diseases of the Throat and Nose*, p. 245, says that "Primary epithelioma of the tonsil is, although rare, not unknown, and three cases have occurred in my own practice during the past twenty years," being, according to his calculation, about 1 in every 20,000 cases of throat disease.

Epithelioma, sarcoma, and scirrhus may each be encountered as a primary affection of the tonsil, and, according to my own experience, in the order given as regards frequency.

Epithelioma involves the tonsil more frequently by extension from neighbouring structures than primarily, but undoubted cases of the latter do occur. In 1890 I

brought a case before the notice of the Medico-Chirurgical Society of Glasgow, and in the communication there made, which was subsequently published in the *Brit. Med. Journal* (vol. i., 1890), I referred to two other cases which had been under my care. Particulars of the case which was then exhibited by me, I will, as it was fairly typical of the condition, give in a few words. Patient was a man 45 years of age, but prematurely old. Four months previous to the time I first saw him he was annoyed by an itching pain in the left ear, which, at the end of a month, was accompanied by a sharp pain in the region of the left fauces. The pain in the throat increased gradually in severity and was aggravated on swallowing—the pain shooting sharply up towards the left ear during each attempt at deglutition. When first seen by me the glands beneath the angle of the jaw on the left side were enlarged and slightly painful to touch. The surface of the left tonsil was ulcerated and the border of the left anterior pillar was infiltrated. The advancing surface of the ulcer was elevated, hard, and indurated, and slight manipulation of the part caused bleeding. It advanced so rapidly that within two months of the first examination the ulcer extended from the junction of the anterior pillar with the tongue on to the tip of the uvula. The patient died of exhaustion, brought about by his inability to swallow nourishment, and from oft repeated attacks of haemorrhage as the ulcer progressed.

The usual symptoms are those met with in this case, viz., disagreeable tickling, amounting almost to pain, in the ear on the affected side, followed later by pain over the affected tonsil on deglutition. This pain is most severe when saliva alone is being swallowed, and is usually out of all proportion to the size of the local sore. The ulcer resembles that of an epithelioma occurring elsewhere—edges

elevated and hard with infiltration of the tissue around, and a foul surface which bleeds readily on slight provocation. The lymphatic glands become involved early in the course of the disease. In cases not operated upon the patient dies from exhaustion, brought about by starvation, broken rest, constitutional contamination, and haemorrhage.

Sarcoma.—In its earlier stages sarcoma of the tonsil is apt to be mistaken for a chronic parenchymatous tonsillitis. The tonsil thus affected is uniformly enlarged, is globular in outline, and smooth on the surface. The tumour may remain for a considerable time encapsuled, during which time the glands remain unaffected. The commonest form and that which grows most rapidly, involving the glands early in its course, is the round-celled variety. Such a case is referred to in my communication to the Medico-Chirurgical Society already quoted. The patient was a man 45 years of age and both tonsils were affected. The tumours grew rapidly, forming two large globular masses which met in the middle line: secondary formations appeared within a very short time, rendering operation for removal inadvisable. At a later period I again saw him with his medical adviser, Dr. Cowan Lees, when, on account of urgent dyspnoea, I performed tracheotomy. His breathing being relieved he lived in tolerable comfort for some weeks, when he died free from pain.

Scirrhus of the tonsil occurs but very rarely, and in the few reported cases the diagnosis has been doubtful until the nature of the growth was declared by microscopic examination.

The early **diagnosis** of malignant disease of the tonsil is of the first importance, because, when detected while yet the tonsil alone is involved, the affected organ may be extirpated.

Epithelioma and scirrhus frequently pass as syphilitic

lesions when first seen, and this diagnosis is sometimes rendered the more probable by the patient's past history. Sarcoma is apt to be mistaken for a chronic inflammation of the substance of the tonsil.

Treatment.—The removal of the affected tonsil should be practised in all cases where the disease is confined to that organ. Thus the earlier the disease is recognised and the tonsil removed, the more hopeful will be the result. There are two methods by which this may be accomplished, namely, removal through the mouth, or through an incision made in the neck. The operation in both cases is rendered less difficult by a preliminary tracheotomy.

In cases of sarcoma the affected tonsil may be enucleated by the finger-nail, by the help of a Volkmann's spoon should the capsule burst, or by means of the écraseur or galvano-cautery. After enucleation it is well to cauterise the surface freely as was done by Dr. Newman in his successful case.

In the removal of epithelioma and carcinoma the mouth may be enlarged by making an incision from the angle of the mouth to the angle of the lower jaw, and the tumour thus brought within easy reach, as was done by Dr. Wm. Macewen in a case of carcinoma which not only involved the tonsil, but also portions of the tongue and pharynx, and which he removed successfully. The alternative in such cases is to make an external incision, in which the myo-hyoid muscle is divided and the lower jaw sawn through in front of the masseter, as practised by Langenbeck and others since.

When from the involvement of surrounding structures or for other reasons, operative measures cannot be resorted to, palliative treatment alone remains. The frequent use of an antiseptic mouth-wash is very comforting. The use of lozenges is to be deprecated in the majority of cases.

on account of the increase of saliva occasioned by their presence in the mouth. In place of these a small quantity of a mixture of biborate of soda, chlorate of potash, and powdered sugar, placed at frequent intervals on the tongue, where becoming moistened it dissolves and is swallowed, is comforting to the patient, and keeps the ulcerated surface comparatively clean, and as a consequence removes the foul odour from the breath.

Where pain is a marked symptom and interferes with deglutition, the raw surface should be brushed gently with a ten per cent. solution of cocaine previous to the taking of food; and when the pain interferes with the patient's rest, sedatives by the mouth or hypodermically may be necessary. Haemorrhage from the surface, which may occur in the progress of any of the forms of malignant disease here as elsewhere, may be checked by the application of various haemostatics. The use of ice, the local application of tannic acid, or the use of a 2 to 5 per cent. solution of antipyrine as a gargle, may each be recommended. When bleeding cannot otherwise be controlled, cauterisation of the surface may be resorted to.

Of various **foreign bodies** which may become lodged in the tonsil, fish-bones are those most frequently encountered. They usually enter one of the follicles and tend to become pushed well into the substance of the tonsil during repeated acts of deglutition. Partly on this account and also because the fish-bone becomes transparent from the moisture of its surroundings, its presence is often difficult of detection, especially if examined with daylight as an illuminant.

When the presence of a fish-bone is suspected, the fauces should be carefully inspected under a bright light, aided it may be by a laryngeal mirror, which latter enables the whole tonsil to be carefully examined, the tongue mean-

while being kept on the floor of the mouth or drawn forwards.

If, however, after a careful survey it is not thus detected, the surface of each tonsil, the rest of the fauces, and the base of the tongue, should be gone over carefully with the forefinger, as by careful palpation with the parts anaesthetised, such a foreign body seldom escapes detection. When discovered, the bone is, as a rule, readily removed by the help of dressing-forceps.

CHAPTER III.

AFFECTIONS OF THE PHARYNX.

PHARYNGITIS.

ACUTE idiopathic inflammation confined to the pharynx is seldom if ever met with, but it is by no means uncommon to have the pharyngeal wall implicated during the course of an acute inflammation of the neighbouring structures. We do have, however, the inflammatory process in an acute form and confined to the pharynx as a result of injury. The swallowing of a fish-bone, pin, or other small sharp body, is the most common cause of this traumatic pharyngitis. When very hot or caustic fluids are swallowed purposely, or by accident, the pharyngeal wall may be acutely inflamed, but the surrounding parts are usually similarly affected.

In such **traumatic cases**, deglutition is always more or less painful, and breathing may, within a short time after receipt of injury, become difficult from the onset of oedema. A case illustrating this I saw in a child four years old, who, while running about amusing himself by blowing through a tin whistle, tripped and fell. In falling, the whistle first came in contact with the ground, and thus thrust backwards, it cut the wall of the buccal pharynx. Suddenly, at the end of two days, during

which time the wound appeared healthy and was healing, the child's life was threatened by the appearance of oedema glottidis, and with such urgent symptoms as to necessitate immediate tracheotomy.

Where the injury results from swallowing some sharp body, as a pin or fish-bone, the part injured should be carefully examined to ascertain whether the foreign body is present or not. It not infrequently happens that when such a body has been swallowed the pharyngeal wall is scratched by it in its progress downwards. The symptoms, however, are such, that the patient invariably insists that the foreign body is still *in situ*, and it is often difficult to convince him otherwise. When present the foreign body must be removed, the after-treatment for the most part being conducted on general principles and according to the severity of the injury. Confinement to bed may be necessary, fluid food should be given, and, if the part is much inflamed, the sucking of ice, along with cocaine pastilles if much pain is complained of, and the frequent use of a warm antiseptic mouth-wash should also be had recourse to. The internal administration of iron is, in some cases, advantageous.

Acute pharyngitis, as part of an inflammation affecting the fauces and pharynx generally, may be met with, originating in the excessive use of alcohol or in the inhalation of irritating fumes. It is, however, usually catarrhal in character, and in this form is not uncommon.

Deglutition is painful, and, in some cases, difficult; but the swelling is seldom so great as to interfere with respiration. When the inflammatory process spreads upwards and involves the Eustachian tubes, deafness, frequently associated with ringing noises in the ears, results. The same process may extend towards and into the nares, or downwards implicating the larynx.

On **examination** the parts involved are swollen and deeply injected, presenting a bright or livid red surface, which, in the early stage, is unduly dry. Later on the parts become moist, and the secretion which then appears is abnormal both in quantity and in character. The presence of tenacious secretion is, in the later stages, the subject of special complaint on the part of the patient.

Prognosis.—If carefully treated the parts usually regain their natural tone and appearance as the inflammatory process subsides. On the other hand, where it is neglected, the condition may end in a chronic pharyngitis, associated with a relaxed state of the uvula and fauces generally.

Treatment.—For the most part the remedies are simple and homely in character. In the early stage of acute pharyngitis, a single small dose (10 minims) of laudanum, or repeated doses of camphorated spirits of wine (10 minims on lump sugar), will in many cases modify, if not check, the condition.

This may be followed by the use of a warm inhalation, the benzoin inhalation, as it is both a sedative and local stimulant, being perhaps the most generally useful. Rhatany pastilles in the interval should be prescribed. The feeling of discomfort bordering on pain in the pharynx so often associated with this condition, may be relieved by a wet compress applied to the neck.

Later on the local application of an astringent solution, such as perchloride of iron (60 grs.–$\bar{3}$j) or sulphate of copper (30 grs.–$\bar{3}$j) is useful in bringing the relaxed mucous membrane into a healthy condition again. When pharyngeal catarrh frequently recurs, much benefit may be derived from the use of iron and ammonia in mixture, under which the attack may become of less frequent occurrence and much shorter duration. In addition to the medicinal remedies employed it is advisable, at least

while the part is inflamed, to recommend rest for the vocal apparatus, and this is essential in those whose duties involve the continuous use of the voice, as in preaching, singing, and the like.

Chronic pharyngitis may follow on an acute attack, though in the majority of cases it does not do so, and is but seldom purely catarrhal in origin.

It occurs in three distinct forms, namely, **general or diffuse pharyngitis, follicular pharyngitis,** and **pharyngitis sicca**, and as they differ in their etiology, in their pathology, and in the treatment necessary, we shall consider them separately.

1. **General pharyngitis** is the form we meet with following an acute attack. But though thus occurring as a catarrhal condition, it is more frequently met with as the result of local irritation, in those whose general health is below par, and it is not infrequently associated with some gastric derangement.

The patient usually **complains** of a fulness in the throat, of some slight difficulty in swallowing, accompanied sometimes by pain, which varies in character and degree. There is a desire to hawk and expectorate on leaving bed in the morning, and this often continues throughout the whole time spent in making the toilet. The constant hawking frequently induces retching, the straining of which may cause rupture of a pharyngeal venula and the expectoration to be tinged with blood, much to the patient's alarm.

On **examination**, the mucous membrane of the pharynx will be found more or less deeply injected, individual vessels which normally are invisible stand out prominently, and their irregular course across the pharynx can readily be traced. The mucous membrane generally appears swollen and there is an excess of secretion, which becomes

tough and adheres firmly to the surface. The fauces will be found in a relaxed condition.

Treatment.—The condition of the general health must have our first consideration. The regulation of the bowels specially by the use of salines, the administration of a chalybeate tonic, out of door exercise, with a plentiful supply of easily-digested food, are necessary; and it may be requisite to advise temporary removal to a dry, bracing climate. Anything which tends to cause local irritation, such as the use of ardent spirits, of tobacco, and of tea, unless it be freshly prepared and not too strong, must be avoided. Where the pharynx is irritated by a relaxed, elongated uvula, a portion of the uvula should be removed. This, though a minor operation, should be performed carefully and in such a way as to have the raw surface after operation directed towards the pharynx, as previously described. When the causes are carefully considered and removed, local treatment in the majority of cases is simple. The occasional use of a sedative steam inhalation at bedtime gives great comfort and hastens the removal of the general congestion. The local use of an astringent, combined with cocaine, in the form of lozenge, such as rhatany and cocaine pastille, or a stimulant such as menthol in lozenge, are each in some cases distinctly beneficial.

The internal administration of glycerine in drachm doses repeated several times daily, and swabbing the surface with a solution of a mineral astringent, such as sulphate of copper (30 grs.–℥j) at intervals, will be found useful in protracted cases. When the secretion is greatly increased and the condition tends to spread towards the nares, the use of chloride of ammonium by inhalation should be recommended. Gargles are useless, as in the great majority of cases they never come into contact with the pharynx,

and the systematic application of astringent pigments I strongly deprecate.

2. **Follicular pharyngitis** occurs in two distinct varieties, namely, the Hypertrophic and the Exudative. The strumous diathesis appears to be the predisposing cause in most cases of hypertrophic pharyngitis: the rheumatic and in some cases the gouty diathesis in the exudative form.

The exciting **causes** are various. Persistent buccal respiration, as necessitated by nasal obstruction and hypertrophy of the tonsils, and over-exertion or improper use of the voice, are not only the chief causes but are the most important. It is thus met with in patients suffering from the various diseases of the nose which cause interference with nasal respiration, and in children suffering from enlarged tonsils. In those latter there is, in addition to the compulsory mouth-breathing, narrowing of the faucial isthmus, so that the air, being inspired through a contracted aperture, impinges with greater velocity than normally on a limited portion of the buccal pharyngeal wall, and causes that part to be affected first. As over-exertion of the voice is an exciting cause, so clergymen and costermongers are frequently affected; and follicular pharyngitis is often spoken of as **clergyman's sore throat.**

Excessive use of tobacco, inhalation of irritating particles or fumes suspended in the atmosphere and such like, by causing local irritation, tend, in those constitutionally so disposed, to result in inflammation of the follicles of the pharynx.

It is a **very chronic** condition, and has usually been present for a lengthened period before advice is sought. In the earlier stages no pain is complained of, a feeling of stiffness and dryness is first observed, and after the prolonged use of the voice there is an aching soreness

extending all over the back of the throat. Later it is found that the voice becomes readily exhausted, the patient gradually finds that he requires to put forth more effort than formerly in reading aloud, preaching, or singing, and sooner or later there is a distinct loss of tone in the singing voice. Attacks of huskiness supervene, necessitating frequent coughing to render the voice clear. There is little tendency for the disease to spread by contiguity to the larynx, though the follicles of the mucous membrane of the larynx may take on the same chronic inflammation, and especially when the pharyngeal condition is of long standing. In many cases it extends upwards to the follicles of the lining membrane of the pharyngo-nasal space, in which case the collection of follicles known as Luschka's tonsil become specially hypertrophied. When this occurs deafness and noises in the ears may be complained of.

The **hypertrophic form** invariably begins on the posterior wall of the buccal pharynx. When the case is examined at a comparatively early stage, several small, smooth, rounded elevations, about the size of a pin's head, are seen dotted over this surface, and isolated from each other. On closer inspection small vessels are noticed running towards and into the separate granules from various directions, forming a network of arterioles, each set leading to a hypertrophied follicle. If seen for the first time at a later stage, the granulations are more numerous, the individual ones are larger, and here and there it will be found that two or more have coalesced, to form a large flat elevation of irregular outline. These elevations are red in colour, and the mucous membrane lying between appears unduly pale by contrast. The morbid changes are for the most part to be found in the epithelium and not in the follicles. The prominences or granulations, which are found to be denuded of the covering or protecting layer of flattened

epithelium, consist of rounded swollen epithelial cells. On account of those prominences the condition is frequently spoken of as *granular pharyngitis*. Occasionally, and especially in neglected cases, the whole of the posterior wall of the pharynx may be obscured by a thick layer of muco-purulent secretion. This is apt to be mistaken for discharge covering an ulcerated surface, but the true state of matters is at once made apparent by the removal of the secretion with a cotton swab or otherwise.

The **exudative form** is frequently associated with follicular tonsillitis, and occurs most usually in those with rheumatic tendencies. The normal secretion of the pharyngeal follicles is clear and watery, but when they become acutely inflamed, it becomes, like the secretion of the tonsillar follicles under similar conditions, opaque and milky in appearance. When the inflammation is of a more chronic character the secretion becomes semi-solid and curd-like, and may be retained within the follicles, from which it is readily expelled by pressure. These spots are found more frequently on the lateral walls than on the posterior wall. On careful inspection each spot is found to mark the minute opening of an individual follicle, the walls of which are swollen from inflammation, or, in some cases, from actual hypertrophy. As the condition progresses the follicles become atrophied from degenerative changes in the secreting tissues of the inflamed and thickened glandulae, and this is accompanied by an atrophy of the submucous tissue generally, by which the pharyngeal cavity becomes considerably increased in size.

Both forms are very chronic in character, and cases of exudative pharyngitis are perhaps more difficult of cure than those of the hypertrophic variety. Both conditions are especially troublesome when affecting public

speakers and singers, and in such the vocal apparatus is very apt to be permanently impaired.

Treatment.—In both varieties of follicular pharyngitis treatment, to be permanently effective, must be constitutional as well as local. In the exudative form, any gouty or rheumatic tendency must be subdued by the use of appropriate remedies, colchicum, salts of lithia, alkalies, or, it may be, a course of properly selected waters; and in the hypertrophic form so frequently associated with the strumous diathesis, cod-liver oil with iron, the latter in an astringent form, should be prescribed.

Locally many methods of treatment have been recommended. In the earlier stages of the hypertrophic form, and while the patient's general health is being improved by constitutional treatment, the pharyngeal wall may, every second or third day, be brushed with a solution of sulphate of copper or perchloride of iron, or with ethereal tincture of iodine, from which much benefit may be derived. I have frequently found camphor-thymol (a fluid preparation got by rubbing together the two substances in equal proportions in a mortar) of considerable service, and would recommend its use where the hypertrophied areas are small and widely distributed. It should be applied firmly all over the surface of the buccal pharynx. When, however, as the patient's health improves, no marked local improvement is observed, the further use of these astringents should be discontinued, as under such circumstances the relief obtained from them will be but temporary, and, in many cases, serious harm results from their indiscriminate use. In such cases, and in cases of long standing, where the granulations are prominent, a cure can only be effected by the destruction of the masses of hypertrophied epithelium. For this purpose nitrate of silver, chromic acid, or sulphate of

iron, fused on the point of a platinum probe, by which the substance employed can be accurately applied to each individual granular point, may be employed, but the results obtained are not encouraging. Morell Mackenzie recommended London paste very strongly. The results obtained from its use are good, the nodules are effectively destroyed; but it causes great pain, and there is often difficulty in limiting its action to the hypertrophied spots. Dr. Carl Michel, in 1873, advocated the employment of the galvano-cautery for the destruction of the hypertrophied follicles, and, following his practice, Dr. David Foulis, of Glasgow, employed the actual cautery for the same purpose, and with excellent results. Now, the electric-cautery is almost universally used, as, with cocaine, its application is rendered perfectly painless. In very bad cases where the granulations are exuberant and flabby, the larger cautery irons, at a dull red or black heat, as recommended and used by Dr. Foulis, may be employed.

In using either form, the surface of the pharynx is first anaesthetised with cocaine, then each individual prominence should be thoroughly destroyed by the cautery. In addition to this, I am in the habit of destroying the small vessels, which lead up to the various spots, by a very light touch of the cautery, thereby cutting off a great part of the blood-supply to the hypertrophied area. Following such an operation the cauterised surface may be soothed and moistened by the use of marsh-mallow lozenges, and the avoidance of hard food is advisable for a day or two.

In the **exudative form** the retained secretion should be removed from the follicles by the use of a pharyngeal curette or a sharp ear-spoon, with which the interior should be well scraped. When thus cleaned out, the interior of

each follicle so treated should be lightly cauterised with a very fine, sharp platinum point. In place of the galvano-cautery, which I consider the most efficacious application for the purpose, strong tincture of iodine, carbolic acid, or solid nitrate of silver, may be tried, as they are recommended by some authorities, and the after-treatment necessary is the same as when the cautery is employed for the destruction of granulations.

3. **Pharyngitis Sicca.**—It is questionable if this form is in any way or at any stage associated with an inflammation of the mucous membrane. The irritability consequent on the dryness of its surface is a constant source of annoyance to the sufferer, but evidences of any inflammatory process are entirely absent. Nasal obstruction from various causes, as pointed out by Dr. Greville MacDonald, is a frequent cause, and we meet with it in a more or less marked degree in those suffering from chronic atrophic rhinitis. It is met with in anaemic women, and especially amongst those who imbibe quantities of long-infused or stewed tea, and those employed in a hot dusty atmosphere.

On **examination** the mucous membrane appears thinned, the surface is smooth, glazed, and dry. On looking downwards it may be noticed that about the level of the dorsum of the tongue there is a line of demarcation running across the pharyngeal wall, above which the mucous membrane is dry and glazed as described, and below which it is moist, and in other respects normal in appearance. This line is produced by contact of the moist tongue with the pharyngeal wall during the act of deglutition. If during examination the patient retches from irritation of the fauces, the pharyngeal mucous membrane "crinkles," when its dry, stiff character is readily appreciated by the observer. In cases of long standing

we frequently find crusts of secretion firmly adherent to the surface of the dry mucous membrane, resembling somewhat the smaller crusts of rupia, though sometimes they are darker in colour from impurities introduced by the air inspired.

Treatment.—In the treatment of this condition general tonics are required, and it is necessary where any obstruction to nasal respiration exists that that function be freely re-established. Locally the best results are obtained from the use of stimulating applications. Of the many medicaments of this nature which may be employed, a combination of camphor and thymol in equal parts, which when rubbed well together form a liquid, and menthol in olive oil in the proportion of 1 to 4, may be recommended. These when employed should be thoroughly rubbed over the affected surface with a swab. In place of the swab, the substance selected may be applied by means of a spray-producer, the simplest form of which is the naso-pharyngeal atomiser of Messrs. Burroughs, Wellcome & Co. The desired material should be dissolved in paroleine (a fluid-fatty base obtained by the fractional distillation of petroleum) in preference to olive or other vegetable oil, as paroleine has a constant and comparatively low specific gravity, it does not become rancid, it is a ready solvent for volatile hydrocarbons like menthol, thymol, etc., it is free from taste and odour, and is, withal, an oily fluid. This latter is of great importance if for nothing else than for the comfort, always appreciated by the patient, imparted to the surface by an oily application. Of the substances which may be used with the atomiser the following, and in the proportions given, may be noted:—Pinol, one part dissolved in nine of paroleine, and thymol of the same strength; menthol, terebene, and camphor employed separately, and each solution containing one part of the active ingredient to four parts of

paroleine. Similar applications may readily be made to the interior of the nose when the nasal lining membrane is similarly affected.

These applications stimulate secretion, which is not only greatly increased in quantity, but very watery in character, with the result that the pharyngeal surface again becomes moist, soft, and flexible.

To the same end ipecacuanha is employed by some, and in the form of lozenge it is readily given with, in some cases, satisfactory results.

Retro-pharyngeal or Post-pharyngeal Abscess.—Post-pharyngeal abscess is almost invariably met with in children, though it is sometimes seen in adults as a complication of influenza. Its **cause** is not always apparent. In the majority of cases the abscess is due to disease (caries) of the bodies of the cervical vertebrae, or to inflammation of the inter-vertebral discs. In other cases it appears as a cellulitis or an inflammation of the connective tissues in front of the vertebrae. This disorder usually occurs after an attack of one or other of the acute specific fevers, especially after scarlet fever, but in some cases no very definite cause can be discovered.

Symptoms.—Difficulty in swallowing and difficulty in breathing are the chief of those, and the dyspnoea may be paroxysmal in character. Respiration, in addition to being obstructed, is frequently accompanied by stridor of a peculiar character, which is most marked when the patient is in the recumbent position and in a deep sleep.

If the abscess is situated in the buccal pharynx the fulness is readily seen on inspection, and fluctuation is detected on palpation. When confined to this area the changes in the breath- and voice-sounds closely resemble those accompanying the presence of enlarged tonsils. Where the abscess is situated at a lower level, dysphagia

and dyspnoea are usually severe, the latter sometimes alarming, and the physical examination is chiefly made by palpation.

Treatment.—When fluctuation is detected the abscess should in all cases be opened as early as possible. If left alone it may burst spontaneously, when there is a risk of the pus, in place of being ejected through the mouth or nose, entering the stomach or the larynx with serious results. It is better to do the operation without the use of a general anaesthetic, though the pharynx may, if desired, be anaesthetised with cocaine. The mouth should be gagged, and, with the patient in the sitting posture and the head well forwards, the abscess should be opened freely with an ordinary or a guarded bistoury. When the wall is tense the pus escapes with great force. The incision made with the knife may, if necessary, and it usually is necessary where the abscess is situated below the buccal pharynx, be increased in size by means of the forefinger. When dependent on disease of the vertebrae, the bony column should be fixed by a form of collar, so that the neck is rendered rigid, and the weight of the head is, through the apparatus, transferred to the shoulders; or by the use of the jury-mast, in conjunction with a Sayre's plaster-jacket. When the abscess results from cellulitis, healing rapidly takes place after incision, symptoms quickly disappear and there is seldom any recurrence. It is well after the operation in all cases to prescribe a solution of some bland antiseptic, such as chlorate of potash or borax, to be sipped in small quantities frequently.

In the earlier stage of those cases associated with disease of the vertebral column, there may be no direct evidence of such being the cause even when the abscess is opened, but as time goes on the symptoms which develop—deformity, etc.—leave no room for doubt.

A case recently under my care in the Western Infirmary (Ward xi.) illustrates the readiness with which an abscess here unconnected with any deep-seated disease, heals after free incision.

A child $2\frac{1}{2}$ years old had had, during the previous six months, increasing difficulty in breathing and swallowing. The voice and respirations closely resembled those of a child with greatly enlarged tonsils. Sleep, which could only be obtained while the child was lying face downwards, was much broken; the child throughout the night was very restless, and breathing, which was accompanied by a loud snoring noise, was very irregular. On examination the bulging of the buccal pharynx was very evident, and on palpation this fluctuant swelling was found to extend downwards to the level of the upper border of the thyroid cartilage. With the mouth gagged the abscess was freely incised and its contents cleaned out with the finger. On the third day, by which time healing of the wound was well advanced, respiration was unobstructed, it was free from noise and regular, and there was no difficulty in swallowing.

CHAPTER IV.

POST-NASAL GROWTHS.

ON the **posterior wall of the pharynx**, above the level of the free edge of the soft palate, there are numerous lymphoid follicles, which are distributed over the surface generally, though they are most numerous towards the middle line between the Eustachian tubes. This collection of lymphoid tissue, which in some cases extends up to the vault of the pharynx, is termed Luschka's tonsil, or the naso-pharyngeal tonsil. Hypertrophy of these follicles, now termed adenoid growths or post-nasal vegetations, and the train of symptoms resulting from their presence, were first fully described by Meyer of Copenhagen in 1868, since which the profession has largely recognised the powerful prejudicial influence they exert on the economy.

Hypertrophy of Luschka's tonsil is in most cases associated with enlargement of the faucial tonsils, and anything which leads to enlargement of the latter favours hypertrophy of this aggregation of lymphoid tissue. Chief amongst the predisposing causes are perhaps the strumous diathesis and dampness of habitation; and naso-pharyngeal catarrh, such as is frequently associated with measles, scarlatina, etc., may act as an exciting cause.

Luschka's tonsil is present in all young children, and as age advances it tends to become atrophied, so that long

before the period of puberty little trace of its previous existence can be detected. In like manner hypertrophy of this adenoid tissue is most frequently met with in children, examples of its occurrence in adults being somewhat rare.

Symptoms.—The **physiognomy** of a child with adenoid vegetations in the naso-pharynx is characteristic, and readily detected by the experienced surgeon. It consists of slight drooping of the eyelids, thickening of the tissues over the bridge of the nose, which is rendered more prominent by the collapsed condition of the *alae nasi*, while the mouth is almost constantly open for purposes of respiration. There is an absence of expression in the features, or there is a look of sadness, and there is lack of resonance in the voice, certain words, into the formation of which the letters *m* and *n* enter, being pronounced as if the nose was blocked.

Besides the look of stupidity, such subjects are usually backward in their education, chiefly from their inability to fix the attention on any subject, a condition termed *aprosexia*. This latter state, as held by Guye of Amsterdam and Wm. Hill of London, may be due to interference with the cerebral circulation, resulting in lymphstasis and a congested state of the veins.

Deafness.—A large percentage of those the subjects of adenoids suffer from deafness. The pharyngeal orifices of the Eustachian tubes may be encroached upon and closed by the hypertrophied gland-tissue, which in some cases is abundant in the neighbourhood of each tube ; but where the hypertrophy is confined to Luschka's tonsil, there may be very considerable increase in its size, without the function of hearing being interfered with. In other cases the Eustachian tubes and tympani, the lining membrane of which is continuous with that of the pharynx, are affected by the naso-pharyngeal inflammation, and

deafness, the result of permanent changes in those structures, results.

Respiration.—In the majority of cases nasal respiration is either greatly impeded or is impossible, and, as in hypertrophy of the faucial tonsils, rest at night is broken, the lungs are imperfectly expanded, and aeration of the blood is inefficiently performed, so that deformities of the chest, anaemia, and the like occur as results.

Bleeding.—Occasionally the hypertrophied tissue bleeds, and the sudden appearance of the escaped blood in the mouth may be alarming until its source is ascertained. This may take place also during sleep, when the blood trickles down the oesophagus into the stomach, and is vomited, often in large quantities.

Examination.—When this condition is suspected in an adult, the naso-pharyngeal space is readily inspected and the presence of growths demonstrated by the use of an

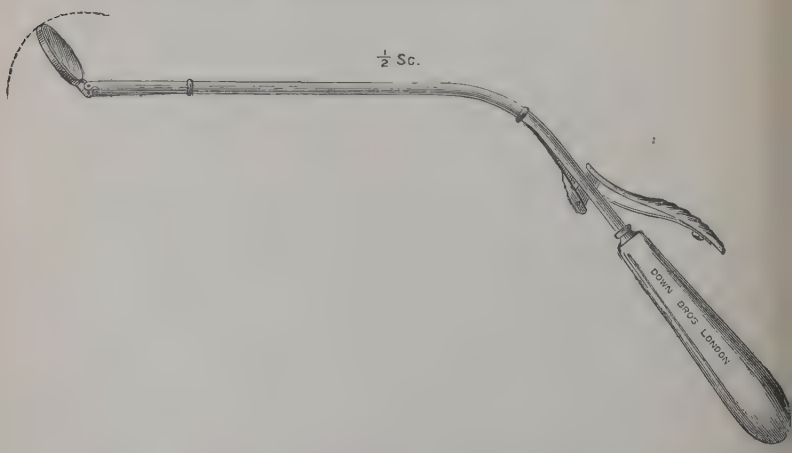


Fig. 15.—Michel's mirror for posterior rhinoscopy.

ordinary laryngeal mirror of medium size, or a rhinoscopic

mirror, which is one so constructed that the angle at which the reflecting mirror meets the stem may be altered at will. Previous to the introduction of the mirror, the soft palate should be drawn forwards, this being most readily accomplished by White's self-retaining palate retractor, by

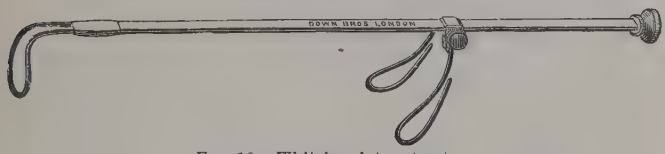


FIG. 16.—White's palate retractor.

means of which the palate is retained in any desired position, while the surgeon's hands are both free.

The mirror having been warmed is introduced into the mouth with the reflecting surface uppermost, and as it is passed behind the soft palate the posterior aspect of that structure is brought into view as well as the hook of the palate retractor. At a higher level, the white line representing the posterior border of the *septum nasi* should be looked for, and on each side of it the oval openings of the posterior nares, containing the rounded prominences of the posterior portions of the turbinal bones. Then, by elevating the handle of the mirror, the adenoid growths springing from the posterior wall and extending up towards the vault of the pharynx are brought into view, and, by moving it laterally, the glandular tissue around the Eustachian tubes may be seen.

In young children it is impossible to adopt this method of examination, and in them the space is most satisfactorily explored by means of the forefinger. In making a digital examination the patient should be seated on a moderately low chair and his head fixed by the surgeon's left hand placed on the vertex. The surgeon, standing at the patient's right side, then introduces his right forefinger

into the patient's open mouth, and, directing it well backwards and downwards to the edge of the soft palate, curves the point of the finger around its free border and thus into the naso-pharyngeal cavity. A beginner frequently fails to enter the cavity, as he invariably pushes a portion of the soft palate backwards and upwards in place of getting the finger beyond its free edge before directing it upwards. In order to explore the space fully it is necessary to stretch the angle of the mouth, gently of course, as far as the second or third molar, and the necessity for this precludes the employment of a gag. As the finger enters the space, adenoid growths, when present, are readily diagnosed, but the important point is to ascertain the extent of the hypertrophic process. To this end, as soon as the finger is passed behind the soft palate, it should be directed forwards, and the posterior nares, with the structures immediately within their boundaries, sought for: then, on either side, the rounded border or cushion of each Eustachian tube is felt. Having made out those landmarks, the position and extent of the hypertrophied tissue, situated on the posterior wall, or in the vault of the pharynx, can be accurately ascertained, the character of the tissue recognised, and the necessary means of treatment decided upon.

Meyer has described the sensation conveyed on pressing the finger into those soft vegetations as like "pushing the finger into a bunch of earth-worms." When speaking to students on this subject, I am in the habit of comparing the sensation to that which one experiences in thrusting the finger into the substance of a rapidly growing sarcomatous tumour, *pushing one's way into friable tissue where the resistance to the progress of the finger is of a comparatively slight character.* This comparison is the more valuable in that any student may, in the operating room, after such a

tumour has been removed, familiarise himself with those sensations and acquire the knowledge more readily than by poking amongst collections of earth-worms.

Appearance.—Adenoid growths when viewed in the mirror are seen to vary in size from that of a split pea to that of a hazel-nut. When grouped together they may form a swelling with a smooth surface ; but where the individual glands remain somewhat isolated, the surface is irregular. The swellings are frequently bright red in colour, though they are usually somewhat pale, and resemble masses of flabby granulation tissue. They consist for the most part of connective tissue, containing lymph corpuscles, and have an abundant blood supply, so that they readily bleed on slight manipulation. When they are met with later in life they are much firmer in structure from the presence of fibrous tissue, and the hypertrophied mass forms a smooth, firm cushion-like swelling. Like Luschka's tonsil in the normal state, those adenoid growths tend to shrink as age advances, and at adolescence they may have entirely disappeared. But effects due to their former presence remain, permanent changes having occurred in the organ of hearing, the voice continues to lack tone, and the patient's health may have suffered seriously in the interval.

Treatment.—When adenoid growths are met with in a child under seven years of age, they may be very thoroughly removed by the finger-nail, as first recommended by Guye of Amsterdam. In dealing with a young patient in whom the presence of such growths is suspected, the surgeon before making a digital examination, as already described, should be prepared to remove what hypertrophied tissue he may find while the finger is within the naso-pharyngeal space. The nail of the forefinger employed should be somewhat longer than is deemed

correct for other purposes, and it should be well cleansed in an antiseptic solution before introduction. The finger-nail has the advantage over forceps, sharp spoons, and the like, in that the surgeon is well informed throughout the operation of the state and position of the growths and the underlying structures. To prevent injury to the finger itself, from the presence of a jagged tooth or from the involuntary action of the masseter muscles, it may be protected by a rubber finger-stall or by the finger of a glove with the terminal portion cut off.

As soon as the finger has entered the space, the hypertrophied tissue which is there felt should be cleared away with the back of the nail, *i.e.*, it is removed by the action of the extensor muscles, and by repeating this pushing action, each time at a higher level, the posterior wall is cleared up to the vault. The finger is then slowly brought downwards, and in its descent the surface is again scraped by the nail, but this time the flexor muscles are called into play; by means of the sharp edge of the nail the firmer connective tissue is scraped away. This operation is followed by free bleeding, but by bringing the patient's head forwards, so that he looks directly downwards, the blood, along with particles of broken-down adenoid tissue, escape through the nares. Bleeding ceases spontaneously within a very short time usually.

In older children, in whom the growths have become less

FIG. 17.—Steel nail or scraper.

friable, the finger-nail is useless for their removal. In such cases the steel nail, an apparatus to be worn over the point

of the fore-finger as devised by Sir William Dalby and Lennox Browne, is useful, or the hypertrophied tissue may be scraped away by curettes as recommended by Meyer,

FIG. 18.—Gottstein's ring-knife.

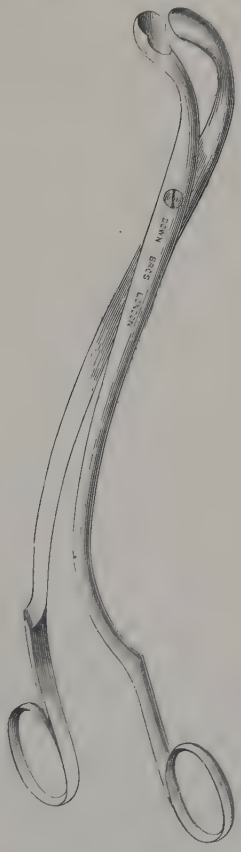


FIG. 19.—Lowenberg's forceps.

Gottstein, Hartmann, and others, each of whom has his own special form of curette or ring-knife, or by the use of

strong cutting forceps after Lowenberg's pattern. These latter, which must be used with great caution, are of most service in clearing the vault of the naso-pharyngeal space. Where it is necessary to resort to the use of instruments like those mentioned, an anaesthetic is required. In some cases it is sufficient to paint the surface freely with a solution of cocaine, but in others a general anaesthetic is to be preferred. When the latter is employed the position of the patient during anaesthesia is all-important, so that the entrance of blood into the gullet or wind-pipe may be prevented. This is most satisfactorily accomplished by having the head thrown well backwards over the upper end of the operating table with a pillow under the shoulders, as, when the head is so over-extended the nasal choanae are placed on a lower level than the pharynx, with the result that blood makes its escape through the nares.

There is rarely any call for the application of a haemostatic, but when bleeding appears unusually profuse it may be readily and comfortably controlled by introducing a strip of lint into the naso-pharyngeal cavity, or still better by filling the space with a small sponge to which a thread has been attached.

The only recommendations in the way of **after-treatment** necessary, are to impress upon the patient the necessity for using the handkerchief freely, in order to prevent the lodgment of secretions, and to practice nasal respiration.

In addition to those local measures it is advisable to prescribe a course of iron and cod-liver oil in almost every case.

CHAPTER V.

INFLAMMATION OF THE LARYNX.

ACUTE LARYNGITIS.

THIS affection is usually catarrhal in origin, and in the majority of cases results from extension downwards of an acute naso-pharyngeal catarrh, which may terminate, by still further extension, in bronchitis. It may, however, originate in, and be confined to, the larynx, especially in children. It is predisposed to by occupations of a sedentary character performed in a heated atmosphere, and the exciting causes are chiefly exposure to cold and wet, inhalation of irritating fumes, violent vocal exertion, and the excessive use of alcohol.

Symptoms.—There is in the early stage slight elevation of temperature, increase in the pulse-rate, and general restlessness. There is pain characterised by the patient as a feeling of rawness in the neighbourhood of the larynx, aggravated by speaking and swallowing. This is, in many cases, accompanied by a feeling of constriction at the upper part of the wind-pipe, especially on exertion. Respirations are more rapid than normal, there is little or no pause between each act, and both inspiration and expiration are accompanied by a sibilant sound, indicating narrowing of the glottis. The voice

is hoarse and deeper in tone than usual. Frequently there is an irritating cough, which, from its peculiar sound, the result of the incomplete closure of the glottis during the act, is spoken of as a "croupy" cough. The expectoration dislodged by attempts to clear the throat, or by means of the cough, is scanty, and in the form of clear, tough mucus, and there may be, though rarely, blood in the expectoration. Where the inflammatory process has extended to the trachea or bronchi, the expectoration becomes copious, white, and frothy.

On **laryngoscopic examination** the laryngeal mucous membrane is found to be deeply injected. The vocal bands may remain somewhat pale, or they may be irregularly injected, but when the condition is severe, they are bright red throughout their length, dry on the surface, and rounded. On attempted phonation they do not meet throughout their length on account of their swollen condition, so that a space elliptical in form remains between them. The ventricular bands, besides being of a bright red colour, are fuller than usual, and may, in some cases, obscure the greater part of the vocal cords.

Acute catarrhal laryngitis is occasionally **complicated** with oedema, though oedema is more frequently seen when the inflammation is the result of scald, or where it is associated with tubercular or syphilitic ulceration, and in cases where there is necrosis of cartilage. When oedema is present, the symptoms referable to respiration and deglutition become more severe. When it involves the epiglottis there is difficulty, in addition to pain, in deglutition, and when the ary-epiglottic and ventricular bands are swollen, dyspnoea may be so severe as to threaten suffocation. The epiglottis, when oedematous, may retain its general form, but with a considerable increase in its thickness, or it may assume the form

already described as somewhat resembling the *os uteri* in appearance. The oedematous ary-epiglottic folds appear as two globular swellings posteriorly, and their presence prevents the interior of the larynx being inspected. When acute catarrhal inflammation causes this condition, the folds are equally affected, but when from other causes, it is frequently limited to one side, or if both be oedematous they are not equally so. With the laryngoscope, patches, the result of submucous haemorrhages, may be observed, and there may be actual bleeding points on the surface. This rare condition has been described as *laryngitis haemorrhagica*, and appears to be met with chiefly in those who, while the general health is low, contract an acute inflammation of the larynx.

A stridulous condition of the breathing, of sudden onset, is not uncommon in children suffering from acute laryngitis. It is caused in a measure by the swollen condition of the parts exciting spasmodic contraction of the adductor muscles, and partly by the presence of tough mucus, which, by adhering to the cords and stretching between them, narrows the air-way. This condition constitutes what is known as "false croup," and the suffocative attacks, though alarming, are seldom serious in their consequences.

Acute catarrhal laryngitis, when occurring in a child, is very apt to be mistaken for laryngeal diphtheria or true croup. The cough, however, in true croup, is husky as compared with the loud clanging so-called "croupy" cough of laryngitis, and the voice in laryngitis is comparatively clear and deep in tone, while in the diphtheritic form it is always husky. The simple catarrhal condition tends to improve almost from the time of its first appearance where there are no complications, while in true croup the symptoms increase in severity. Where examination

with the laryngoscope is possible it should be employed, as by such means the presence or absence of pseudo-membrane in the larynx can be determined and doubt in the diagnosis removed.

Treatment.—In all cases of acute laryngitis it is necessary to have the patient confined to bed, and to recommend complete rest to the vocal apparatus. In the case of children it is of the first importance to begin active treatment by the administration of an emetic, such as wine of ipecacuanha in drachm doses, with five to ten grains of sulphate of zinc in each dose. The patient should drink freely of warm water after taking the mixture, which should be repeated every ten minutes until emesis is produced. In adults some prefer the use of a saline purge, but an emetic is quicker in its action and in many cases is wonderfully effective in cutting short the attack. This should be followed by the use of hot moist inhalations of a sedative character, as *vapor conii* or *vapor lupuli*. When the patient is a child it is better to surround the bed with a tent and to have the air within the enclosure moistened with steam by means of a "croup-kettle" than attempt to have an inhaler used. Considerable comfort is usually experienced by adult patients from the use of a diaphoretic preparation, such as Dover's powder or liquor ammoniae acetatis with wine of antimony. When the cough is troublesome lozenges of cocaine, menthol, or ipecacuanha and morphia, relieve the laryngeal irritation and ensure rest to the parts. If there is much pain, hot fomentations or a hot poultice to the upper part of the chest and front of the neck gives considerable relief, and when the breathing is difficult the benefit derived from a mustard plaster used as a rubefacient, or a fly-blister, is often of a very distinct character. The good effect of a fly-blister is perhaps most marked in the case of children with stridulous breathing.

When haemorrhage from the inflamed surface occurs, a solution of tannic acid or of perchloride of iron may be applied to the interior of the larynx in the form of a spray. When oedema is a marked feature the swollen surface may be pricked or scarified with a laryngeal lancet ; but should dyspnoea become urgent, tracheotomy must be performed without delay. In such cases it is a perfectly satisfactory operation, and the patient is grateful for the relief given. Following the operation the patient must be confined to bed, which should be surrounded by a tent, especially during the prevalence of east wind. The atmosphere may or may not be charged with steam, but a sponge wrung out of a hot carbolised solution—strength 1 in 80—should be placed on the neck, so covering the end of the tube that all air inspired is warmed and moistened by passing through it. The sponge must be changed frequently, and each should be well wrung and distinctly hot on application. In simple catarrhal laryngitis the tube can, as a rule, be removed by the third or fourth day, when the edges of the wound in the neck may be brought together by strips of adhesive plaster.

CHRONIC LARYNGITIS.

Laryngitis may occur in a chronic form as a manifestation, and associated with other evidences, of syphilis, tuberculosis, and other general diseases, which conditions will be referred to when those affections are being considered. The simple form may follow an acute laryngitis, and this is specially liable to occur when during the acute attack or during convalescence the voice has not been rested. It is frequently associated with chronic pharyngitis, especially in those whose calling necessitates the prolonged use or straining of the voice, and where

the working day is spent in a dusty or otherwise impure atmosphere, and it is aggravated by conditions necessitating mouth-breathing. It is most commonly met with in adult males, though a certain form associated with anaemia and relaxation of the laryngeal mucous membrane occurs in anaemic women.

Symptoms.—The chief subjective symptoms are a sense of dryness and irritation in the throat, with persistent huskiness or it may be aphonia, and a constant desire to clear away the cause of the huskiness by hawking. These symptoms are intensified by the use of the voice which so adds to the actual pain in some cases that the patient prefers to remain silent; in other cases even slight exertion of the voice produces a painfully tired feeling in the larynx. The patient in describing the state of his vocal function usually says that on rising in the morning he is husky or aphonic, and has the inclination to cough frequently, but after partaking of a warm breakfast the voice becomes comparatively clear, though it is readily tired on exertion, and hoarseness again supervenes early in the afternoon, attempts on his part to clear it rather adding to, than relieving the huskiness.

On **examination** it will be found that the appearance of the parts varies according to the cause and the chronicity of the case. When comparatively recent there is a general fulness, the lining mucous membrane is deep red in colour, the surface is dry, and scattered over it and firmly adherent to it are patches of dried, often dark-coloured, mucus. In other cases the hyperaemia may appear localised in certain portions of the larynx, which is specially the case where the condition is due to over-use of the voice; and the parts most frequently so affected are the ventricular bands and the inter-arytenoid fold. The former may become so full as nearly or even completely to obscure the vocal cords by

overlapping, and they may meet in the middle line during phonation. Swelling of the inter-arytenoid fold, by preventing the complete approximation of the vocal cords posteriorly during vocalisation, produces huskiness of the voice. When the condition is of long-standing the whole lining membrane of the larynx may be hypertrophied, or this change may be limited to certain portions, such as the posterior surface of the epiglottis, the ventricular bands, the inter-arytenoid fold, or the vocal cords. These latter, when affected throughout their length, are rounded, their free border may be irregular in outline, their surface coated with dried mucus, and their movements hampered accordingly, all of which are most readily observed during attempts at phonation. The surface of the vocal cords under such circumstances frequently become roughened. This condition has been called chorditis tuberosa, and is most usually seen in vocalists. When such a condition is neglected, or when the exciting cause remains, it may result in the appearance of new formations, chiefly in the form of papillomata. These may be found springing from any part of the lining membrane, but are most frequently met with on the ventricular bands, on the surface or from the edge of one or both vocal cords, and from the anterior commissure. It not infrequently happens that when such growths appear, the surrounding hyperaemia diminishes or entirely disappears, when the growth stands out the more prominently.

When the inflammatory process attacks the follicles of the larynx there is usually but little general thickening, but the small racemose glands become hypertrophied. The secretion is retained, giving to the part affected a spotted appearance. This pent-up secretion often makes its escape by ulceration of the covering mucous membrane, these small ulcers sometimes persisting when the general health is not good.

This follicular laryngitis is frequently associated with inflammation of the pharyngeal follicles, and is met with in its most aggravated form in those who use the voice in the open air and under varying atmospheric conditions, such as hawkers, street preachers, and singers.

In some cases the inflammatory process may specially affect the sub-glottic mucous membrane, in which case we find on examination a red prominence on one or both sides, beneath the vocal cords projecting towards the middle line.

Prognosis in chronic laryngitis greatly depends on the patient's ability to carry out treatment. If his circumstances compel him to continue straining his voice, or prevent him seeking a purer atmosphere, or otherwise protecting himself from the conditions which keep up the irritation, little permanent improvement can be hoped for from medication. When the conditions are the reverse of these, the majority of cases will be found amenable to treatment.

Treatment.—In the treatment of chronic catarrhal laryngitis the patient must be impressed with the necessity of carefully regulating the use of the voice, or it may be, of resting it absolutely. He must also be directed to avoid irritating highly-spiced foods, alcoholic liquors, and tobacco. When the condition is met with in one accustomed to high living, as is sometimes the case, dieting is necessary; but, in the majority of such patients, general tonics are called for, and, when the health is below par, change to a bracing climate is often advantageous.

Locally, I prefer, in most cases, to begin medication by the use of a hot, moist inhalation of a stimulating character. For this purpose oil of eucalyptus, oil of pine, and other terebinthinates, rendered miscible with water by the use of light carbonate of magnesia (*see*

formulae), are quite appropriate. When huskiness is severe, or when there is aphonia, I frequently prescribe a combination something like the following:—

℞ Spt. Camphorae, - - - ℥ij.
Spt. Menth. Pip., - - - ℥j.
Tinct. Benz. Co. - - - ad ℥j. ℿ.

Sig.—A teaspoonful to be added to half a pint of water, at 140° F., in a Maw's inhaler, or in a quart-jug, and the steam to be inhaled for five minutes.

This should be repeated two or three times a day when the patient can remain indoors, but when it is necessary for him to continue at work, and especially during the prevalence of cold weather, it is advisable to employ the inhalation at bedtime only. In no case should the patient leave his room for at least one hour after the use of a hot inhalation. By the use of medicated steam, the circulation through the parts is increased, with a consequent increase in the secretions, and the surface being rendered clean and moist, is in a more favourable state to receive benefit from local applications. Where, for any reason, it is thought unwise to recommend hot inhalations, the interior of the larynx may be sprayed at frequent intervals with ipecacuanha wine, which tends to promote secretion from the surface. In cases in which the patient is under the necessity of pursuing his work in an impure atmosphere, a respirator should be worn as a protective measure. When the hardened adherent mucus has been removed, the congested and hypertrophied mucous membrane should be sprayed or brushed with a solution of an astringent stimulant.

Of the various pigments, metallic astringents in watery solution have been the most largely employed, such as sulphate of iron (℥ij to ℥j), sulphate of copper (30 grs. to ℥j), chloride of zinc (20 grs. to ℥j), or

perchloride of iron 3j to one ounce of glycerin may be used.

The chloride of zinc and the sulphate of copper I prefer, and in cases where there is much hypertrophy, Lin. iodi. 3ij to 3j of glycerin. They may be applied by means of a swab or a laryngeal atomiser. Menthol, in olive oil (20 %), or menthol, 20 grs., dissolved in a dram of rectified spirits, then added to seven drams of pure glycerin, is of considerable service, and has, of late, been much in vogue. When those various pigments cannot be applied with any degree of regularity, the inhalation of nascent chloride of ammonium, prepared by a Vereker or Godfrey apparatus, forms a very effective substitute.

When, from the amount of hypertrophy, the ventricular bands obscure or interfere with the movements of the vocal cords, and where there is, as a consequence, persistent huskiness, this may be entirely remedied by the careful use of the galvano-cautery. After anaesthetising the parts with cocaine the surface of the thickened ventricular bands should be touched at intervals with a fine pointed cautery, the point entering the tissue to the depth of from $\frac{1}{16}$ to $\frac{1}{8}$ of an inch. The effects of the resulting cicatrisation will be found most satisfactory. In like manner the irregular thickening of the cords—chorditis tuberosa—can be quite removed, and this method will be found much more satisfactory than the frequent and prolonged application of caustic solutions.

CHAPTER VI.

TUMOURS OF THE LARYNX.

GROWTHS, both **innocent and malignant**, are met with in the larynx, and by means of the laryngoscope precision in their diagnosis is readily attained, and their treatment rendered accurate.

BENIGN NEOPLASMS.

Growths of an **innocent character** are met with in persons of all ages from infancy onwards, though they are most common in early middle life, least common in old age, and they are met with in both sexes, the relative frequency being about three in the male to two in the female.

Causes.—Growths of a kind occur associated with tubercular laryngitis, and these are chiefly in the form of exuberant granulations springing from an ulcerated surface. In syphilitic patients gummata occur in some cases, while in others there may be masses of granulation tissue which are usually found surrounding a sinus communicating with necrosing cartilage. These will be referred to in their appropriate places. Of the causes of other benign growths, persistent hyperaemia is perhaps the chief. Thus we meet with them in those who, while suffering from laryngitis, are

under the necessity of straining the voice. Shouting, as I have observed in a river pilot, and in a foreman in a boiler-shop, severe coughing, etc., may cause a submucous haemorrhage resulting in a neoplasm. Warty growths in the larynx may be found in those who have them on other parts of the body.

Of the different **varieties** of innocent growths seen here, **papillomata** are of most frequent occurrence, being met with, according to Mackenzie's statistics, in 67 per cent. of all benign tumours of the larynx. These are most usually met with in children, are almost always sessile, occasionally solitary, though usually multiple, and occur on any part of the laryngeal surface from the epiglottis downwards. (See Figs. 22 and 23.) In size they vary from that of a pin's head upwards. A warty mass may spring from either side of the larynx and, meeting in the middle line, seriously interfere with respiration, while in other cases a single growth may assume such proportions as to threaten suffocation. Microscopically they are seen to consist of connective tissue coated with epithelium.

Mucous polypi are occasionally met with. In three of such cases which I have seen—one in a man, two in women—the growths all sprang from the same position, namely, the anterior commissure at or below the level of the vocal cords. In each case there was a single tumour only, pale in colour, smooth and glistening on the surface, pedunculated, and resembling a nasal mucous polypus in structure. In one of my cases, a woman 54 years of age, the point of origin of the polypus was immediately below the level of the vocal cords in the middle line anteriorly, and it was attached by a long pedicle. During inspiration it was invisible, but by a forced expiratory effort, and always during phonation, it was thrown upwards, passing through the glottis with a

noise similar to that made by the lips and tongue in pronouncing "fla" sharply. It then lay on the surface of the

FIG. 20.—Mucous polypus springing from epiglottis below level of vocal cords. Position occupied during phonation. Removed with snare, July 1886.

vocal cords, being made to vibrate by the force of the air emitted, and it passed downwards again and out of sight during inspiration.

Fibromata occasionally occur. They are solitary as a rule, and sometimes attain to a great size. When small they may be rounded and smooth on the surface, but as they increase in size their surface becomes rough and irregular. In one case of fibroma under my care, the tumour, which was sessile, sprang from the edge and the under surface of the right vocal cord, and was fully as

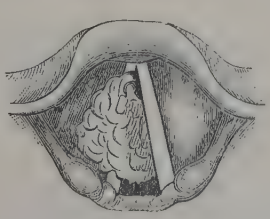


FIG. 21.—Large fibroma attached to right vocal cord and subglottic tissue in man aged 53. Removed by laryngotomy, February 1890.

large as a common marble. It was rough on the surface, greyish in colour, and from its size formed a serious impediment to the patient's respiration. Its removal

through the mouth was considered impracticable, and I performed thyrotomy by which means it was satisfactorily extirpated. The abundance of fibrous tissue seen on microscopic examination determines its classification. **Cystic tumours, cartilaginous outgrowths,** and **angiomata,** may be met with, though they occur but very rarely in the larynx.

The **symptoms** which accompany the presence of a benign growth in the larynx vary chiefly according to the size of the growth, to its position, and whether it be sessile or pedunculated. Interference with voice, with respiration, and in some cases with deglutition, are the principal subjective symptoms. Pain is exceptional, and when present it usually follows on the prolonged use of the voice.

A growth, no matter how small, placed on the surface of one or other vocal cord, interferes with the vibrations of that cord, or if it springs from the edge of, or is so situated as to project between the cords, persistent hoarseness results. Again, if pedunculated, it may from its movements during respiration produce spasm of the larynx, and dyspnoea may result from the presence of a large growth or from several smaller ones so situated as to materially narrow the air-way. A tumour situated on the epiglottis tends to interfere with deglutition, though I have had at least one case, referred to me by Dr. W. L. Reid, of a papilloma about the size of a pea situated on the laryngeal surface of the epiglottis immediately below its upper border with absolutely no symptoms resulting from its presence.

Persistent huskiness is the symptom on account of which the majority of sufferers seek advice, and under favourable circumstances and when the condition is due to the presence of a growth, there is usually very little

difficulty in making ocular demonstration of its cause by means of the laryngoscope aided by a good light. A dependent epiglottis and irritable fauces are the chief sources of difficulty in the adult. The former may be overcome by raising the epiglottis with a hook or by pressing with a curved spatula on the glosso-epiglottic fold, by which means the epiglottis may be brought to the upright position or even curved towards the tongue. Irritability of the fauces is readily controlled by the use of cocaine. General swelling from congestion, such as may be due to a catarrhal state of the parts, may for the time obscure the neoplasm, but on the subsidence of this hyperaemia it may be brought into view.

In the case of children, with the help of cocaine and with patience, the parts in most cases can be viewed. In a small minority, usually in very young children, the diagnosis is largely based on the subjective symptoms of which continued aphonia and dyspnoea on exertion are the chief. The laryngoscopic appearance of the growth varies according to the category to which it belongs, and the prognosis and treatment likewise.

Prognosis.—The effects of the presence of new growths in the larynx are, as has been said, two-fold, namely, interference with voice and interference with respiration, the latter so great sometimes as to threaten life. In giving a prognosis therefore, both of these points must be seriously considered. The hope of recovering and retaining clear voice after treatment, depends largely on the size, position, and nature of the growth. When it is single, pedunculated, and can be removed through the mouth, the normal vocal functions will, in the majority of cases, be restored by its removal. When the tumour is large and sessile, and in the case of papillomata, which tend to recur after removal, clear voice, after operation,

cannot be promised, though it may, and often does, follow.

Death from suffocation, from the presence of benign growths in the larynx, is, in adults, very rare, and by appropriate treatment is in all cases preventible. In children, on the other hand, prognosis is more serious, on account of the smaller calibre of the larynx and from the readiness with which spasm is induced. Frequent attacks of laryngismus in a child, associated with a husky voice, or with aphonia, is of grave significance, and calls for active treatment.

Treatment.—In considering the treatment to be adopted where there are growths in the larynx, I am in the habit of dividing the subject into medicinal and surgical measures, the latter being subdivided into curative and palliative procedures. Some few isolated instances have been reported of spontaneous cure, the growth being dislodged by coughing; and other cases of spontaneous disappearance have occurred while a tracheotomy tube was being worn. Absorption of warty growths is reported to have occurred in at least one case, from the pressure exerted by an O'Dwyer's laryngeal tube which had been introduced, and continued to be worn, for the relief of dyspnoea. But these cases are so exceptional that they need not here be further considered.

Medicinal.—The internal administration of medicines is followed by most satisfactory results in some cases occurring in children. In them we may meet with a roughened condition of the lining membrane of the larynx, the elevations resembling small papillomata, though possibly due to inherited syphilis. These children suffer from aphonia, or, if voice is present, it is rough and husky in character. The regular administration of grey powder in small doses—$\frac{1}{2}$ to 1 gr., combined with the same quantity

of sodae bicarb.—in such cases is frequently followed by the disappearance of the prominences and recovery of voice.

Again, the effects of the administration of arsenic in cases of papillomata in children is sometimes marvellous. As far as my individual experience goes, it cannot be regarded as a specific, as I have found it to fail in several cases, but it is nevertheless well worthy of a trial. I can cite at least three cases of multiple papillomata in children—two males and one female—varying in age from 8 to 11 years, in whom, under arsenic, the growths disappeared. They did so entirely in two of the cases, while in the third, the smaller growths disappeared, leaving one, somewhat larger than a split pea, situated at the junction of the cords anteriorly. Arsenic, as is known to dermatologists, exerts its influence chiefly upon the epidermis, and diseases affecting the more superficial strata of the skin are most amenable to its influence. According to Dr. Duhring, it possesses little or no effect upon the diseases which have their seat in the deeper structures. Thus, while the papilloma is small and connected with the epithelium alone, arsenic may be expected to exert a favourable influence upon its removal. Liquor potassii arsenitis (Fowler's Solution) is the most suitable preparation to employ, and the dose, beginning with one minim, repeated twice daily, should be gradually increased.

Surgical.—(*a*) The chief **palliative** measure is tracheotomy. It is resorted to for the relief of breathing in those cases where, for some reason, a radical operation is impossible. In cases of emergency it may be performed as a matter of necessity in curable cases, to be followed by a radical operation.

(*b*) **Curative Proceedings.**—These include the various means for the destruction and removal of the growth,

and are divided into intra- and extra-laryngeal methods, according whether the operation is performed through the mouth or by means of an opening through the wall of the larynx or trachea.

Intra-laryngeal.—Chemical caustics, freely employed in the earlier years of laryngoscopy, are now seldom used for the destruction of laryngeal neoplasms, but the galvano-cautery in its improved forms is frequently employed, and is of great service. Of other means, forceps, snares, and the guillotine, are the chief.

In the removal of growths *per vias naturales*, a general anaesthetic should never be employed, but in all cases the fauces and pharynx, as well as the laryngeal mucous membrane, should be anaesthetised by means of cocaine. The patient should be in the same position as for an ordinary laryngoscopic examination, and he should be so situated that the larynx can be easily and well illuminated. As the surgeon requires to have both hands free, the patient is directed to grasp the tongue between the folds of a fine towel and to hold it in the protruded position. The surgeon then examines the larynx, holding the laryngeal mirror in the left hand, and, with the growth well in view, he introduces the instrument, chosen for its removal, held in his right hand.

When the growth is solitary and small it may be snipped off with cutting forceps, or it may be crushed by more powerful forceps and left to slough off, or it may be destroyed by means of the galvano-cautery. The latter I have employed solely in several cases when the growths in each larynx was very small and sessile. In one, referred to me by Dr. Andrew Wilson of Bellahouston, the lady, aged 25, had been husky for close on five years, the cause of this being a small papilloma springing from the edge and upper surface of the left vocal cord, which prevented

the due approximation of the cords and interfered with the vibrations of the left one during vocalisation. The outgrowth was less than half the length of its base, and though its position was most suitable for the application

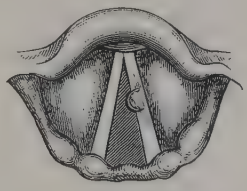


FIG. 22.—Small papilloma growing from left vocal cord. Removed by cautery.

of the snare, yet its size and shape precluded the use of such. With a very fine knife-shaped cautery I cut into either side, then so cauterised the base as to stop the blood-supply. At the end of a fortnight the voice was perfectly clear, and only on very careful examination could a slight irregularity be observed on the edge of the cord marking the site of the growth. A second case, a lady 32 years of age, referred to me by Dr. Bell of Larbert, had a similar sessile papilloma springing from the upper surface of the vocal cord. This I treated in a similar fashion with a like satisfactory result. Another case, sent to me by Dr. Hawthorne, complaining of persistent huskiness and frequent tickling cough without any physical sign in the chest, was found when examined laryngoscopically to have a small papilloma springing from the free edge of the right vocal cord near the anterior commissure, which was under cocaine removed by the galvano-cautery point.

The galvano-cautery may also be applied after the removal of growths by forceps, snare, etc., and in the form of a caustic snare it may be employed in the removal of large firm fibromata. The forceps employed

vary both in size and shape according to the object aimed at in their use—whether for crushing the growth or for its evulsion—and also according to the position of the growth in the larynx. When used to crush and thus destroy the vitality of a growth they require to be strong, with flat roughened blades. I have thus used them for the destruction of granulation-tissue growths with satisfactory results, and they may be similarly employed for the removal of small sessile growths. With similar forceps I was lately able to remove a peculiarly hard flat papilloma about half an inch in length from the left ventricular band of a patient, aged 42, referred to me by Dr. James Wilson of Govan. Caught by the forceps it was readily stripped from the surface and appeared to be attached to the mucosa only. For cutting purposes Mackenzie's spoon-shaped and punch forceps are the best.

Snares.—Pedunculated mucous polypi are perhaps most readily and most satisfactorily removed by means of a snare, of which form of instrument there is an almost endless variety. Stoerk's form, furnished with a variety of rigid tubes of different curves through which the wire passes, or the same handle with a flexible metallic tube, is the most generally useful. The mucous polypi springing from the anterior commissure in the three cases already referred to were removed by such an instrument with comparative ease, and the snare is the most suitable instrument in all larger growths. Professor Stoerk's laryngeal guillotine may in some cases be found convenient, especially when the growth is firm and springing from the edge of either the ventricular bands or the vocal cords.

Extra-laryngeal.—The majority of simple growths are removable by the intra-laryngeal method and should be

so operated upon. There are two out-standing exceptions however, the one being a large firm fibroma with an extensive attachment, and which an experienced operator has failed to remove through the mouth. Multiple papillomata in children form the second exception on account of the readiness with which they recur. These latter can only be successfully extirpated by the extra-laryngeal operation.

This operation is a serious one, and fraught with certain dangers, chief amongst which is pneumonia, so that every care must be taken not only during the operation, but in the subsequent treatment. The operation is conveniently divided into two stages—(1) Preliminary tracheotomy (not universally adopted), followed by (2) thyrotomy or laryngotomy.

As I have performed the operation several times, both for the removal of innocent growths and for the extirpation of malignant tumours, I shall, to avoid complicating the description, simply detail the methods which I employ.

In all cases I do a preliminary tracheotomy in the usual way, and recommend it, taking care to open the trachea at as low a level as possible. This will vary according to the length and circumference of the neck and the position of the trachea. In the performance of the operation care should also be taken to keep the isthmus of the thyroid gland below the level of the opening to be made in the trachea.

The incision through the skin, and the dissection through the underlying tissues, must be made exactly in the middle line. A short thick neck adds to the difficulties of the operation, and in such cases the size of the anterior jugular vein may still further complicate matters. This vein occupies the median line, and its size, which varies, is dependent on the degree of development of the external jugular. If it cannot be readily laid to one side during the

dissection, a double ligature should be passed round it, the separate threads tied at the distance of half an inch from each other, and the vein divided between them. When the trachea is fully exposed it is fixed in the middle line by means of a sharp hook, and opened by entering the knife (short blade, strong and sharp) at the lowest part of the wound and cutting upwards. A tube is then introduced, preferably a Foulis tube, which is fixed in position by a tape from either end passed round the neck. The patient should then be placed in bed, protected from draught, in a room with a temperature of from 65° to 70° F., and the air he breathes should be moistened with steam, at least during the first forty-eight hours. This may be accomplished by the use of the "croup-kettle," or simply by the application of a sponge, wrung out of hot water, over the neck, and so placed as to cover the end of the tube, that all air inspired by passing through the sponge may be warmed and moistened. The sponge should be frequently changed and at no time allowed to become cold when on the neck.

After an interval varying from three to eight days, according to the condition of the patient, the second stage of the operation may be performed. Chloroform is inhaled by the patient through the tracheal tube. The incision through the skin made while performing tracheotomy is extended upwards in the middle line towards and almost up to the hyoid bone, and the cricoid and thyroid cartilages are carefully exposed. Any cut vessel should be ligatured before the cartilages are divided, and by the frequent application of small sponges on holders blood is prevented from trickling downwards to the trachea. To prevent blood from entering the trachea during the progress of the operation, some surgeons have packing of various kinds (sponge, cork, etc.) so fixed to the tracheal cannula as to

completely fill the space between the cannula and the wall of the trachea. Trendelenburg's apparatus, which is perhaps the most widely used, is in the form of a tracheotomy tube with thin rubber tissue surrounding and fixed to the lower third, and so arranged that when the tube is in position the rubber tissue can be inflated so as to fill up the space around the cannula. I employed this form in my first case, but found it so much in the way on account of its size, besides the constant risk of pricking the inflated pad, that in subsequent operations I preferred to do without it. Now, I either entirely withdraw the tracheal cannula when the upper cartilages—cricoid and thyroid—are exposed, and before dividing them, or leave a Foulis tube in position and pack the space between the tube and the trachea with small pieces of sponge attached to threads. The cartilages having been exposed, are then split in the middle line. Some operators simply open the crico-thyroid membrane and thyroid cartilage—thyrotomy. I prefer to split both cricoid and thyroid cartilages, thus performing laryngotomy in the full sense of the term. The cartilages are readily divided by means of a knife or scissors in children and young adults, but in patients over forty the cartilages will frequently be found calcified and so hard as to necessitate the employment of cutting forceps.

When dealing with innocent growths it is advisable in dividing the thyroid cartilage to leave a small portion at its upper border intact, to insure the exact replacement of parts after the operation. In this way there is greater certainty in the restoration of the vocal function. (According to Mackenzie's statistics, aphonia follows thyrotomy for removal of benign growths in 40 per cent. of those thus operated upon.) When dealing with a malignant growth, on the other hand, such a precaution is not necessary,

as in all probability the excision of the part affected will necessarily interfere with the vocal function, and in such cases a large incision is required for the complete extirpation of the disease, which latter is of the first importance.

After division of the cartilages the two sides of the larynx are separated and held apart by retractors, the interior of the larynx is carefully dried with sponges and illuminated with, preferably, an electric forehead lamp. The growths clearly visible are then removed. Papillomata are most readily removed with scissors curved on the flat, and the parts from which they spring should be cauterised with the galvano-cautery. Hard fibromata may be removed by the same means or with the snare.

After making sure that all growths have been removed and that bleeding is entirely checked, the parts may be brought together. I prefer to stitch the skin over the thyroid and cricoid, though some employ adhesive plaster to bring the parts together ; then the tracheotomy tube is re-inserted and fixed with tape passed round the neck, and the patient treated in the same way as after an ordinary tracheotomy. As pneumonia is the chief danger, very careful nursing is necessary during the first few days after the operation.

The tracheal tube should be removed at the earliest possible moment, the time at which this was permissible in my own cases having varied from the second to the fifth day after operation.

Compared with the operation in the adult, laryngotomy in the child is a comparatively easy operation, due in great measure to the elasticity of the cartilages.

In one case I performed the operation in an adult (male) for removal of a large fibroma (fig. 21, p. 125). Tracheotomy was hurriedly performed for the relief of urgent dyspnoea and the major operation performed subsequently. Among the

children on whom I have operated was a boy ten years of age, whom I showed before the Glasgow Southern Medical Society. On exposing the interior of the larynx, the lining membrane of it and of the trachea was found to be studded with numerous small warty growths, each of which I destroyed with the cautery. On the wall of the larynx immediately below the level of the glottis were four growths varying in size from that of a split pea to that of a moderately large horse-bean, which were removed with scissors and the parts from which they sprang cauterised.

FIG. 23.—Multiple papillomata in boy, as seen during attempted phonation. Removed by laryngotomy.

FIG. 24.—Largest of fourteen growths removed (natural size).

There was also one large growth springing from the right vocal cord, and two smaller ones—one from the commissure and one from the left vocal cord—all of which were similarly treated, and the boy made an uninterrupted recovery.

MALIGNANT NEW-GROWTHS.

Sarcoma and **carcinoma** are both met with in the larynx as primary affections, and when the disease in the larynx is secondary to its appearance elsewhere it is almost always the result of extension from neighbouring structures, rarely as a result of general cancerous infection. Sarcoma occurs but rarely, scirrhus is very seldom met

with, while epithelioma is the form with which we almost universally encounter malignant disease in the larynx. The majority of cases occur between the ages of 45 and 65, though it does occur in earlier life, and the cause is as obscure as is the appearance of the disease in other parts of the body.

Malignant disease in the larynx is much more common in males than in females — the reverse of that which obtains in cancerous disease generally. The proportions given by Fauvel, Mackenzie, and Ziemssen are about 4 to 1, while my own numbers, in cases of malignant disease affecting the larynx *primarily*, with a considerably smaller experience than the authorities quoted, is 13 in the male to 2 in the female.

Symptoms.—In many cases **hoarseness** is the first symptom to attract attention. This may be due to implication of the recurrent laryngeal nerves on the affected side, or to mechanical interference with the free movement of the vocal apparatus from the presence of the tumour. In several of my cases this was for many months the only symptom and that on account of which advice was sought. Complete loss of voice, except where the disease is in a very advanced stage, is rare. **Pain** is the next most frequent source of complaint, and it tends to increase as the disease advances. The stage at which pain first appears and its severity depend largely on the part affected. Occasionally the complaint is of pain shooting up to the ear on the affected side, due probably to irritation of the sensory fibres of the superior laryngeal nerve distributed to the surface affected, which is conducted to the auricular branch of the vagus.

As the tumour increases in size, **dyspnoea** may occur and deglutition become difficult or impossible, according to the position and size of the growth. All those

symptoms, however, may be present apart from the occurrence of malignant disease; but in the latter condition there is associated with them a history of gradual **loss of energy**, and it may be **loss of flesh**; the pulse becomes small and rapid, and where ulceration has occurred the breath is markedly fetid and expectoration may be streaked with blood.

There is less room for doubt in the **laryngoscopic appearances** of the parts affected, though in some cases even the most experienced laryngologist will hesitate to differentiate between the ulcer of malignant disease and that of tertiary syphilis.

Sarcoma occurs as a sessile tumour with a smooth or lobulated surface, and usually pale or yellowish-red in colour.

Epithelioma in the earlier stage is circumscribed, irregularly circular in outline, and is usually found to originate in one of the vocal cords, or in one or other of the ventricular bands. From its point of origin it may spread in every direction, and a very large portion of the larynx may be involved before death ensues. As the diseased process advances the surface ulcerates. The resulting ulcer is irregular in form, with raised edges surrounded by an area of induration and having a foul surface, in all respects similar to an epitheliomatous ulcer met with in the tonsil, fauces, and elsewhere.

The disease is usually well advanced before the lymphatics communicate infection to the glands in the neck, and it is only in cases where the disease is extensive and of considerable standing that the cancerous cachexia declares itself. A **case** on which I operated in September, 1892, illustrates the history common to the majority of cases of primary epithelioma of the larynx. The man was 56 years of age, tall, erect, and the picture of health.

He had complained of huskiness for close on six months, but had given it little attention as he considered it the result of a cold and that it would pass away. As latterly the huskiness had become aggravated, though unaccompanied by pain, he came to the Throat and Nose Department of the Western Infirmary. At that time I was from home on holiday and he was seen by Dr. Rutherfurd, who found the whole larynx to be deeply injected, and the ventricular bands considerably swollen, the swelling being symmetrical, as if the result of catarrhal inflammation. He accordingly prescribed a hot sedative inhalation. At the end of ten days when I saw him the general swelling had subsided, and a tumour of the left vocal cord was readily brought into view. It occupied the centre of the cord, and its length was equal to half the full length of the cord. It was irregularly circular in outline, bluish-grey in colour, and the substance of the central half of the cord was incorporated with the new growth. The free portion of

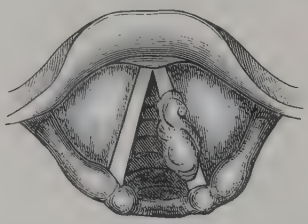


FIG. 25.—Epithelioma of left vocal cord. Removed by laryngotomy, September, 1892.

the left cord, anterior and posterior to the tumour, was, apart from slight injection, normal in appearance. Looking down on the tumour with the laryngeal mirror in the ordinary position, it appeared about the size and of the shape of a small horse-bean, but on examining it laterally

it was seen to be greater in bulk than the view from above led one to infer. This, however, is the rule. The sketch here given of the tumour in this case would serve for several such cases which I have seen, the position, the size, the form, and the colour being almost identical in each. On my strong recommendation he submitted to extirpation of the growth.

On the 13th of the month I performed tracheotomy, which, on account of the short, thick-set form of his neck, and the presence of an unusually large median vein, was somewhat difficult, and it was found impossible to go so low down as is desirable in tracheotomy, preliminary to thyrotomy. On the 20th I opened the larynx in the manner previously described. When the cartilages were separated and the tumour fully exposed, the larynx was illuminated by means of a Trouvé lamp, the whole of the left vocal band carefully dissected off the cartilage, and the surrounding surface cauterised. The tracheal cannula was removed on the fourth day, and the wound in the neck was practically healed at the end of a fortnight. This patient was exhibited at a meeting of the Glasgow Medico-Chirurgical Society seven months after the date of operation, along with microscopic sections of the growth prepared in the Pathological Department of the Western Infirmary by Dr. L. R. Sutherland, which showed that the tumour had all the characteristics of a typical epithelioma. Now, seventeen months after operation, there is no recurrence, and in the production of voice, which is fairly clear, the right vocal cord crosses the middle line and rises to meet the free edge of the left ventricular band, which has thus assumed the rôle of a true vocal cord.

In a case of epithelioma which occurred in a female 40 years of age, and whom I saw with Professor Gairdner,

the site of the growth was the *inter-arytenoid membrane*, in my experience a very unusual starting-point. It formed a thick tumour in this position, projecting both anteriorly into the larynx and posteriorly into the oesophagus. Dysphagia was the prominent symptom throughout, and the woman virtually died from inability to take nourishment.

Another very unusual case I would cite, which also occurred in a woman, but is not included in my list of *primary* cases. She had a well marked epithelioma of the left vocal cord which had appeared about four months after the detection of a scirrhous tumour of the left mamma.

Prognosis.—The occurrence of malignant disease in the larynx is always of the most serious significance. It tends, sooner or later, to end in death, and the time at which this may supervene depends on a variety of circumstances. When so situated as to interfere with deglutition, the process of exhaustion may be rapid, although the length of time a patient so affected can subsist on the minimum of nourishment is sometimes remarkable. Again, from various causes, oedema glottidis may suddenly appear, and severe haemorrhage, due to advancing ulceration, may occur, which, unless relieved or checked, as the case may be, may materially shorten life.

Treatment.—When there is a doubt as to whether the disease is cancer or syphilis, a fair trial should be given to anti-syphilitic remedies, whether a history of the latter disease is obtainable or not; but further valuable time should not be lost when no improvement is noticeable at the end of two or three weeks. When the disease is undoubtedly malignant, operative measures should, in all suitable cases, be at once adopted.

Endo-laryngeal extirpation should hardly ever be attempted, the only condition under which it might be

considered being the case of a small well-defined sarcoma. In the great majority of cases, if the diseased area cannot be completely extirpated, no operation, apart from tracheotomy, when dyspnoea is urgent, should be attempted. For the removal of the growth we must choose between **thyrotomy** and **extirpation** of the **larynx**, there being, in my opinion, no useful middle course.

The **operation** of thyrotomy or laryngotomy for the removal of malignant growths is conducted in the manner described for the removal of benign neoplasms. When the tumour is exposed it must be completely removed, and with a wide margin. Haemorrhage, after the removal of the tumour, can be controlled by cauterizing, or by packing the laryngeal cavity with antiseptic gauze. This latter method in malignant disease is very important: the packing may be left in for twenty-four hours, the patient breathing through the tracheal cannula entirely, and at the end of that time the gauze may be cautiously removed. The interior of the larynx can then be leisurely and very thoroughly explored, when the surgeon can see whether or not the disease has been completely removed. When satisfied with the condition of the larynx, the parts can be replaced, bringing them together by sutures or by the use of strips of adhesive plaster.

The results obtained by this operation have been given by T. Bruns who collected particulars of twenty such cases. Two died soon after the operation, and in the great majority the disease recurred within the larynx before the end of six months, in one at the end of eighteen months, and in another, though the patient had no local recurrence, he died of cancer affecting the kidney and supra-renal capsules, twenty-two months after operation.

Total **extirpation** of the larynx for cancer was first

performed successfully by Billroth in 1873, and in this country by Foulis of Glasgow in 1877, his case and the operation being fully described in the *Lancet* of October 13, 1877. Of nineteen cases collected by Mackenzie, eight died from collapse or pneumonia within two weeks from date of operation; in three cases, one of carcinoma and two of sarcoma, a cure was effected; and in the remaining cases the disease recurred within from three to ten months after the operation.

Three successful cases out of nineteen operated upon, form a sufficiently large proportion, when we take into account the nature of the disease, not only to warrant the performance of the operation, but to enable us to strongly recommend its adoption in suitable cases.

CHAPTER VII.

FOREIGN BODIES IN THE PHARYNX AND LARYNX.

A VARIETY of foreign bodies may become lodged in the pharynx and upper part of the oesophagus. Fish-bones, pins, coins, portions of tough food, artificial teeth, orange-pips, and grape seeds, are those most commonly encountered. Coins, artificial teeth, and small bodies, such as orange-pips, frequently become lodged in the fossae between the glosso-epiglottic ligaments, and they may lie there for a considerable time without causing any serious irritation, though as a rule their presence creates considerable disturbance. **Sharp bodies,** like fish-bones, pins, needles, and bristles from a tooth-brush, most frequently get lodged in one of the tonsils, actually perforating its tissue or entering a follicle. If they get beyond the tonsil they may scratch the pharyngeal wall on their passage towards and down the oesophagus, or they may perforate the wall and remain fixed in a great variety of positions. When the wall has been scratched by the foreign body in its downward progress the patient's sensations are similar to those caused by its impaction, and it is often difficult to convince him that the part is wounded only, and that no foreign body is present. When lodged in any part of the

pharyngeal wall such a foreign body is usually readily detected. A small bone may enter one of the circumvallate papillae of the tongue and be readily overlooked. Such a case I saw in the person of a medical student, and it was only after carefully searching the parts with the laryngeal mirror that the small outstanding portion was brought into view and removed. It must be remembered that fish-bones and bristles become translucent, and are thus readily overlooked, from the moist condition of their surroundings, and in this state they resemble a "thread" of tenacious mucus, which is very plentiful when a foreign body, causing pain, is present.

A **case** of impacted fish-bone which I had referred to me by Dr. W. L. Reid was unusual on account of the size of the bone and the position in which it was fixed. While masticating the fish the patient became sensible that he had a bone in his mouth, and somehow, while trying to separate it from the food in the mouth by means of the tongue, it slipped over. One end had become embedded in the base of the tongue, and the other end in the posterior wall of the pharynx, so that it crossed the larynx anteroposteriorly, and lay in contact with the upper edge of the epiglottis. When removed it was found to be an unusually stout bone, measuring $1\frac{1}{2}$ inch in length.

A **large body,** such as a piece of insufficiently masticated beef, etc., may become so lodged as to block up the entrance to the larynx. This accident usually occurs when the individual makes a sharp inspiratory effort, as in laughing while the foreign body is in the mouth or in the act of being swallowed. Foreign bodies, as pointed out by Erichsen, are not introduced into the air passages by deglutition, for no substance can be swallowed through the glottis, but they are *inhaled*. This is equally true in cases where the epiglottis is more or

less destroyed, as in those cases in which it is entirely absent.

Occasionally we meet with a child having some foreign body—a coin, button, bean, pea, or the like—which it has placed in the mouth during play, becoming impacted in the larynx or drawn into the trachea. When the body is flat it may become lodged between the ventricular band and the vocal cord, or may slip into one of the ventricles, but when rounded it usually passes through the glottis into the trachea, and if very small it may even enter one of the bronchi.

When such a **foreign body enters the larynx**, violent coughing immediately results with, it may be, the instantaneous expulsion of the intruder. Where however it is not so dislodged, but remains in the laryngeal cavity and below the level of the glottis, symptoms of dyspnoea may show themselves, respiration being interfered with as a result of mechanical obstruction, or on account of spasm of the glottis induced by its presence. On the other hand, during an inspiratory effort while the patient is coughing, the foreign body may be sucked into the trachea, and the symptoms then set up depend largely on the size, shape, and nature of the body, and the position it takes up. If it be comparatively small and rounded there may be no symptoms to indicate its presence. Spasm of the glottis which may have been alarming while the body was in the higher reaches of the larynx, and the spasmodic choking cough, suddenly disappear and there may be no interference with respiration. Occasionally by placing the fingers over the trachea and directing the patient to cough or to breathe forcibly, the movements of the foreign body may be felt. When such a body becomes impacted in one or other bronchus the respiratory murmur and vocal fremitus over the corresponding lung will be diminished, or absent

when the blockage is complete. When the body is larger and more nearly filling up the lumen of the trachea, symptoms of suffocation will be present which, if not relieved, may terminate fatally, but when it is of such a character as to increase in size from absorption of moisture, as a bean, piece of ginger, etc., suffocative symptoms may supervene, it may be, days after its introduction. Then change of position of the foreign body may produce spasm in a case where previously there had been no urgent symptom. Irregularly shaped bodies may set up inflammation of the trachea, which may lead to ulceration of its walls, or pneumonia may result.

Treatment.—In those urgent cases when from the size, nature, or position of the foreign body, suffocation is imminent, the sufferer may be inverted—if a child he may be held up by the feet, while an adult may be bent over the back of a chair—and when in this inverted position a sharp blow should be dealt on the back between the shoulder-blades which, by causing a forcible expiration, will frequently instantaneously dislodge the foreign body. When this happy result does not follow, tracheotomy should be at once performed. As soon as the trachea is opened, the patient, though he be unconscious, takes a deep breath, and this deep inspiration is followed by a sharp cough, which in the majority of cases dislodges the foreign body. The entrance of the cold air into the opened trachea is sufficient to excite the necessary expiratory blast, and to obtain full advantage of it to dislodge a body which has entered, the edges of the incision in the trachea should be at once widely separated by the use of retractors and the like.

When the symptoms of suffocation are due to the impaction of a piece of beef, tripe, or other tough material, if it is not dislodged by the inversion method, the surgeon

should introduce his forefinger into the patient's mouth and, getting it beyond the epiglottis, try to hook up the cause of obstruction. If this is not at once successful, tracheotomy must be performed. My friend, Dr. John Wright, had recently an interesting experience. While on his round of visits his attention was called to the condition of a child who, while playing at 'marbles,' had placed one in its mouth and had suddenly shown symptoms of choking. The child was unconscious, its face livid and covered with perspiration. He at once opened the trachea, the marble was coughed up into the mouth, from which it was quickly removed, and an uninterrupted recovery followed.

Where the **symptoms** are **less urgent** a careful inspection of the parts to ascertain the nature, size, shape, and position of the foreign body is of the first importance. Negative evidence thus obtained is in many cases equally valuable.

When the foreign body can be seen by the use of the laryngoscope it can usually be removed through the mouth by the help of forceps. Their application must always be made under the guidance of the eye, and the impacted body grasped while it is clearly seen in the laryngeal mirror. Where the foreign body is lodged in the trachea and it cannot be displaced by the 'inversion' method, tracheotomy should always be performed. The symptoms may not be of an urgent character if the body is a small one, but it is apt to have its position so altered during coughing, etc., as to render its presence a source of great, and it may be sudden, danger. When it is not expelled on opening the trachea as already described, forceps, preferably tube-forceps, introduced through the opening in the trachea, may be employed by which the foreign body is grasped and removed.

Recently I had an interesting case where a portion of a nut was impacted in the right bronchus.

The patient was a boy, seven years of age, who, while chewing a Brazil nut, laughed at his companion who had begun to eat a decayed one, and, while so laughing, he accidentally inhaled a portion of the nut in his mouth. Dyspnoea at once supervened, but after a few seconds he was able to run to his father's shop, a distance of some 300 yards. There he told his father that a piece of a nut had stuck in his throat, and as he appeared to breathe with difficulty, his father administered soda-water as an emetic. After vomiting he breathed more freely, was taken home, and put to bed. This was on Monday, 24th November. During the evening and throughout the night he had frequent attacks of cough, accompanied by very slight difficulty in breathing. On the following day he complained of pain in the region between the lower angle of the right scapula and the vertebral column. For this he was poulticed by his mother, but as no relief followed the hot applications, and as the cough persisted, he was taken to a doctor, who apparently looked upon the condition as catarrhal, and prescribed accordingly. On Thursday, the 27th, Dr. James A. Adams was called. He found the patient flushed, with a temperature of 104·2° F., breathing rapidly, and with a persistent hard cough. On viewing the chest it was seen that, while the left side expanded freely on inspiration, no movement could be detected over the right side. On auscultation, air was heard to enter the left lung freely, but it was thought that none whatever entered the right lung, as over it there was complete absence of the respiratory murmur and of vocal fremitus. At the request of Dr. Adams I saw the patient late the same evening, when, in addition to the

above physical signs, there was an area of dulness on percussion over the base of the right lung, and slight fetor of the breath. There was no doubt of the blockage of the right bronchus, and it seemed probable that suppuration had taken place around the foreign body, so I strongly advised early operation, consent to which was very reluctantly given.

On the following morning, the patient having been put under the influence of chloroform by Dr. A. N. M'Gregor, I cut down upon the trachea. The patient was then allowed in great measure to recover consciousness before the trachea was opened, in order that the full effect might be obtained from the coughing which would follow the entrance of air through the tracheal opening. When the trachea was opened the edges of the wound were held widely apart by the blades of a pair of tracheal dilating forceps, but as the boy coughed, mucus and blood alone were expelled. When the coughing had somewhat subsided, a fine laryngeal probe was introduced through the tracheal opening and passed down along the right wall of the trachea to the distance of about three inches. Then, by moving the point towards the middle line, I attempted to dislodge the foreign body. While this was being done the patient gave a violent cough, which resulted in the expulsion of a quantity of somewhat foetid muco-pus, and, along with it, a portion of the kernel of a nut. More muco-purulent expectoration followed, accompanied by other two small portions of the same material. On examination it was found that air now entered the right lung freely. A Foulis' tube was inserted, and the patient put to bed.

The largest portion expelled was pyramidal in shape, and the base which exhibited the brown covering of the

kernel measured one-fourth of an inch across, and from base to apex it measured three-eighths of an inch. The two smaller portions together equalled the size of a split pea.

The tracheotomy tube was removed the following day, the edges of the wound stitched, and dressings applied. The patient had an uninterrupted recovery.

CHAPTER VIII.

SYPHILIS.

I. SYPHILITIC AFFECTIONS OF THE MOUTH, FAUCES, AND PHARYNX.

IN the examination of the throat we are constantly reminded, by the large proportion of such cases, of the widespread character of syphilis. In this region evidence of its presence in all its stages is found. A primary sore, though rarely met with here, is occasionally seen, and the possibility of its occurrence must always be borne in mind. The lesions seen in the majority of cases are the various local manifestations of the constitutional disease.

A **primary chancre** may occur on the lips (see fig. 1, p. 4), on the lining membrane of the cheeks, on the tongue, or on the tonsils. The initial lesion so situated is always single, circular in form, with elevated indurated edges, and the lymphatic glands on the affected side are always enlarged. It is rarely a venereal sore when found here, though it results from direct contact with the syphilitic virus. The lip may be infected by kissing, by the use of a pipe, drinking vessel, or the like, previously used by a syphilitic patient with sores about the mouth. In a case reported by Dr. P. C. Smith of Motherwell, a tooth-brush was the

means of conveying the infection; and Dr. Robert Mackintosh of Mortlake relates an interesting case where a young lady was infected by her sister's baby, the teat of whose feeding-bottle she was in the habit of moistening before putting it in the child's mouth. The occurrence of such cases should teach us to impress upon patients with syphilitic eruptions about the mouth the necessity of guarding against the use of their drinking vessels, spoons, towels, and the like, by other people, as in this way a whole household may become infected.

The earliest local manifestation of constitutional syphilis is **erythema** of the palate and fauces. It is thus the first as it is the commonest of the secondary symptoms. It may be unaccompanied by pain, so that its presence is unknown to the patient, and the attention of the surgeon may not be called to it. Usually, however, there is a sense of dryness, accompanied by discomfort or actual pain on swallowing, and a varying degree of febricula.

This erythematous state affecting the palate and fauces resembles, in its early stage, the general injection associated with catarrh, with scarlet fever, and that resulting from the use of irritants and stimulants. When the condition is of catarrhal origin, after persisting for a few days, it fades away gradually until the whole surface has resumed its normal colour; and that resulting from the use of stimulants disappears in a similar fashion, when the cause has been removed.

The injection associated with scarlet fever is also general, affecting the whole surface equally, until it entirely disappears. Like the others it is bright red at first, but as time goes on it becomes dusky, or even livid, and if unaccompanied by any deep tonsillar inflammation it gradually subsides. (The age of the patient and the

presence of the characteristic skin-eruption will, in the majority of cases, remove doubt as to the cause.)

When the erythema is of syphilitic origin the palate and fauces are at first uniformly red, but within three or four days the redness becomes distinctly *limited*—limited in the great majority of cases to the anterior pillars and tonsils—its distribution is *symmetrical*, and the injected area on each side has a *sharp line of demarcation.*

This erythema is, often within a few days, followed by the appearance of "**mucous patches**" distributed, in the first instance, over the pillars of the fauces and over the tonsils. Later on they are met with at the angles of the mouth, on the lips and tongue, and over the lining membrane of the mouth generally, but especially around the last molar tooth where the surface readily becomes eroded.

On the first appearance of these patches, which, as a general rule, is at the end of ten weeks after contagion, or six weeks after the appearance of the primary sore, they are of a delicate grey colour, with a glistening surface, closely resembling the slimy track left by a snail on a stone or green leaf over which it has passed, and thus they are at this stage sometimes spoken of as "**snail-tracks.**" Within a very short time, however, they become more clearly defined, each patch is elevated above the surface, circular in outline, and the glistening appearance of the surface is lost; it becomes an opaque greyish-white, closely resembling a portion of a mucous surface recently touched with solid nitrate of silver.

These "mucous patches" or "mucous plaques" are the papules of the general eruption altered by the moisture of the surface affected, and the grey colour of the patches is due to swelling and death of their covering epithelium. Patches occurring on the tongue, as a result of *leucoplacia*

buccalis, or "psoriasis of the tongue," are somewhat similar in appearance to the mucous patches or flat condylomata of syphilis, for which they may readily be mistaken. The former, however, according to Fagge, are the result of local irritation, such as the heat and friction of the pipe, and are thus unsymmetrical in their distribution; they are for the most part confined to the mucous membrane, affecting the tissues less deeply than the syphilitic lesion, and they usually become the seat of malignant disease after a lapse of time. Where appropriate treatment—medicinal, dietetic, and hygienic—is not at once adopted, the softened covering of those mucous patches is cast off, and ulcers result. These ulcers are of a very superficial character, and might more appropriately be termed "**erosions**," reserving "ulceration," as I prefer to do, for the tertiary abrasions. Besides being shallow they are irregularly circular in outline, frequently kidney-shaped; the edges are bright red, and the surface, which readily bleeds when exposed, is covered with yellowish-grey secretion. Mucous patches and erosions on the fauces are usually symmetrical in their distribution over the two sides; they are coincident with the erythematous or roseolous rashes met with over the skin generally and with the falling out of the hair. Their site is usually determined by irritation. When alcohol, especially in its stronger forms, is used, the abrasions of the faucial mucous membrane may be very extensive; the use of the pipe, the presence of a ragged tooth, etc., will most certainly lead to the formation of a mucous patch on the lip, on the tongue, or over the part of the cheek irritated, in one who has contracted syphilis; while the erosion may refuse to heal and may even spread so long as the source of irritation persists.

Those patches and erosions, forming part of what are

arbitrarily, though very conveniently, termed secondary symptoms, occurring in a patient who is otherwise in good health and in whom there is no local irritant present, tend to disappear spontaneously at the end of six or eight weeks. This occurs even when no treatment has been adopted, and this fact should be borne in mind, for as their presence is frequently unaccompanied by pain the patient, when suffering from some later development of syphilis, may state on being interrogated that he never had "sore throat," and there is nothing to indicate its previous existence. When those symptoms have once completely disappeared they seldom re-appear in the same form, unless the general health is low from poor feeding or from indulgence in alcohol; and after a distinct period of immunity their presence is quite exceptional.

Associated with these early manifestations of constitutional syphilis, we occasionally have the tongue presenting a patchy appearance from the destruction of the proper papillae over various parts of its dorsum. These "bald patches" are red in colour, clearly defined, and stand in marked contrast to the surrounding furred surface.

In other cases, in place of the papillae being destroyed, they become hypertrophied, producing, as pointed out by Mr. Jonathan Hutchinson, warts or condylomata. In the former the papillae are free and separate from each other, while in the formation of condylomata the hypertrophied papillae become fused together by swelling of the intervening tissues, and present a flat-topped, elevated area. These hypertrophies specially occur on the dorsum immediately in front of the circumvallate papillae, and there possibly because it is the part of the tongue which when at rest is most exempt from pressure.

Tertiary Lesions.—The evidences of tertiary syphilis most commonly met with in the fauces and pharynx are

(1) acute phagedaenic inflammation, (2) gummata, and (3) ulcers.

Tertiary lesions are usually single, and when multiple they are not distributed symmetrically as secondary lesions are. They are rarely seen within two years from date of contraction of the disease, and it may be that they only make their appearance after a long interval of immunity from symptoms referable to syphilis, during which time excellent health has been enjoyed.

1. **Acute Phagedaenic Inflammation** may occur in any part of the mouth or throat. The parts affected become deeply injected, considerably swollen, and destruction of the area involved takes place rapidly. By this acute inflammatory process the uvula, the soft palate, and other parts attacked, slough and disappear within an incredibly short time.

2. **Gummata**, which are localised swellings consisting primarily of inflammatory products—granulation tissue with a delicate fibrous stroma—are sometimes limited to the mucous membrane, though more usually they affect the deeper structures and lead to extensive destruction of the parts involved. The palate is their favourite site, but they are frequently situated in the tonsils, the fauces, the pharynx, and the larynx. This gummy tumour may be slow of growth, or it may form rapidly; in either form it tends to break down. When of a chronic character, it is unaccompanied by pain; but should it become more acutely inflamed, as in that which forms rapidly, its presence causes considerable pain.

When examined in this stage the gumma appears as a smooth swelling, uniformly red or, frequently, livid towards the centre of its surface. Within a few days a grey spot appears where previously the surface was livid, denoting necrosis of the mucous membrane, and as this

slough separates it exposes a degree of destruction alarming to contemplate, the process having involved and destroyed the soft tissues, cartilage, periosteum, and bone. Thus when the gumma has been situated in the palate, a communication is at once established between the cavity of the mouth and the interior of the nose.

3. **Ulcers** resulting from tertiary syphilis are of two distinct kinds—superficial and deep or perforating ulcers.

The **superficial variety** chiefly affects the veil of the palate, and from this the ulceration may spread to the faucial pillars and tonsils. These ulcers are irregularly circular in outline, and extend rapidly but not deeply, being confined to the superficial structures, the mucous membrane, and submucous tissue. Their surface is covered with ill-formed, watery pus mixed with mucus, and when this is wiped off with a swab or otherwise, the surface exposed is pale and irregular from the presence of flabby granulations. The edges of the ulcers are injected and bleed readily.

The second form of ulcer, namely, the **deep** or **perforating**, results from the breaking down of a gumma. It may be situated, as has been said, on any part of the palate, soft or hard, on the tonsil, the fauces, or pharynx; and in comparing these ulcers, which, though they occupy a comparatively small area superficially, penetrate deeply, with the superficial ulcers just described, the aphorism of Lanceraux, "that they gain in depth what they lose in extent," is frequently quoted.

II. SYPHILITIC LESIONS IN THE LARYNX.

The **larynx** may be affected by syphilis both in its **secondary** and **tertiary stages**. While the fauces bear evidence of secondary syphilis, the laryngeal mucous

membrane frequently becomes injected generally. This is most marked in those who, while so affected, continue to use the voice freely. Under such circumstances the **hyperaemia** is exaggerated, causing swelling of the mucous membrane, and the resulting fulness of the vocal cords renders the voice husky. As this general hyperaemia subsides the surface of the vocal cords becomes mottled—red and white—and this appearance may persist for a considerable time.

Mucous patches occasionally occur in the larynx, and they may affect any part of the covering mucous membrane, though usually their site is determined by irritation, such as the passage of food and the use of the voice. When they are met with here, the mouth and fauces are usually severely affected, and the body will be found to be covered with a copious eruption.

Condylomata also occur in a fair proportion of patients suffering from syphilis. They are perhaps most frequently situated on the epiglottis, and they are similar in appearance to condylomata occurring on other mucous surfaces. Just as erosions follow the advent of erythema and mucous patches in the fauces, so here occasionally the result is similar. The **erosion** occurs most frequently along the free edge of each vocal cord, those parts, namely, which during vocalisation are constantly irritated by contact with each other. This erosion involves the mucous membrane only, and it gives the edge of the cord affected an irregular outline.

These manifestations of secondary syphilis in the larynx run a course similar to that described as taking place in the fauces when they are so affected.

Persistent huskiness, which is the most constant, as it is the most marked, feature of this secondary implication of the larynx, is of a character peculiar to itself, and readily

recognised by an experienced ear. Although the lesions just described may involve a large area and the parts affected appear acutely inflamed, yet to one's astonishment there is almost complete absence of pain. The patient seldom complains of more than discomfort, and that only while using the voice and during the act of deglutition. Except in cases where actual destruction of tissue has taken place, the voice is completely restored under appropriate treatment, although a vocalist so affected does not always recover complete purity of tone on account of localised submucous thickenings which occasionally remain.

The affections of the larynx associated with tertiary syphilis almost always begin as a **gumma**, which, breaking down and liquefying leads to deep and permanent destruction of tissue, and is followed by cicatrices which by contraction greatly alter the form and function of the larynx.

This destructive lesion usually occurs in the larynx as a *late* manifestation of the disease, although I have seen it within three years of date of infection, and in one such case—a married woman in the Western Infirmary—the cartilage was so rapidly and extensively destroyed as to lead to the patient's death.

The **tertiary ulcer** is usually single, and when of a limited character, it most frequently, according to Gottstein, attacks the vocal cords. The result is the destruction of a portion or the whole of the cord affected. When the epiglottis is attacked the cartilage becomes destroyed in whole or in part (see fig. 10, p. 42). As a result the epiglottis may appear notched on its free border, or all above the level of the upper border of the thyroid cartilage may be lost. From the epiglottis the ulcerative process may spread to the ary-epiglottic folds, to the ventricular band, and to the other cartilages of the larynx, destroying

the parts invaded more or less extensively according to the virulence of the disease and the state of the patient's general health.

It is only occasionally that the surgeon has the opportunity of seeing the lesion in the early stage—the stage of syphilitic deposit—as liquefaction has usually taken place before the patient presents himself for examination. When seen in the early stage the gumma appears as a rounded, smooth swelling, varying in size, deep red in colour, except when in connection with the epiglottis, in which case it is pale or yellowish pink. As in the gummy tumour of the palate and fauces, a yellowish grey spot soon appears at the centre of its surface, and rapid sloughing of the swelling follows. The resulting ulcer is deep with ragged prominent edges; it is surrounded by a deeply-injected area; and its surface is covered with muco-pus.

Lesions, in every way similar to those associated with tertiary syphilis, occur in the subjects of **inherited syphilis.** When such lesions appear in early adolescence, the sufferer as a rule bears other evidences of the inherited taint, such as notching of the permanent central incisors ("Hutchinson's teeth"), interstitial keratitis, etc. But apart from those readily recognised cases, I have met with examples of what I consider another phase of the same disease. These, who are usually patients about 40 years of age and over, have swellings in the larynx which, rapidly breaking down, result in great destruction of tissue, followed by marked cicatrisation on healing. They deny having suffered from venereal disease at any time, are without history of secondary symptoms, bear no evidence of primary sore, glandular enlargements or cicatrices on the fauces, and in their family life there is no history of miscarriage, the children born to them being healthy.

From the appearance of the initial swelling, the rapidity of the destructive process, the characters of the resulting ulcer, and the marked contraction of the cicatrices, I consider such cases to be syphilitic in nature: in all probability a late development, though it constituted in them the first observed lesion, of the inherited disease.

Results.—Phagedaenic inflammation results in rapid destruction of the structures involved. After the necrosed tissues have separated, the raw surfaces heal, and parts which may lie in contact during this process unite. Thus the posterior pillars may become adherent to the posterior wall of the pharynx where those surfaces have been ulcerated, and the communication between the nose and the throat narrowed as a result; and where the ulceration has been more extensive the free edge of the soft palate, as well as the faucial pillars, may become welded to the pharyngeal wall, communication being completely cut off between the pharynx and the pharyngo-nasal space. The most marked **example** of this latter condition which has come under my observation was referred to me by Dr. William M'Farlane of this city, and the parts involved are now in the Pathological Museum of the Western Infirmary (Series iii., No. 9). The patient was an unmarried girl of 22 years. In August, 1881, when four months pregnant, her throat became red and painful, but there was no difficulty in swallowing. Accompanying the sore throat she had the usual symptoms of syphilis, including falling out of hair, spots on arms and chest, etc. During eighteen months from this date, she had occasional treatment only, and at the end of that time she was referred to the Royal Infirmary, when the specific nature of her throat affection was diagnosed and appropriate treatment recommended. The raw surfaces seemed to heal quickly under the treatment, but difficulty in

swallowing set in and rapidly increased, the faucial isthmus becoming steadily more and more narrow. About twelve months before death, nasal respiration was quite impossible, the chink through which she both swallowed and breathed appeared to be about one-fourth of an inch in diameter, and when admitted to hospital (Feby., 1885) a No. 6 gum elastic catheter was firmly caught when introduced through the orifice. She had considerable dyspnoea on slight exertion, but she was able to go about quietly without much difficulty in breathing. She took food very slowly, swallowing it in infinitesimal quantities, but she was able to take sufficient in the form of porridge and milk, tea with bread, bacon and finely-minced meat with fat, to nourish her. The preparation in the museum includes tongue, soft palate, fauces, pharynx, larynx, and trachea. The fauces are completely occluded, with the exception of a small round aperture about one-eighth of an inch in diameter. In the general adhesion of parts, the uvula, the faucial pillars, and tonsils are united to each other, to the pharynx behind, and to the base of the tongue. The nasal surface of the soft palate is seen in the specimen from above, and the buccal surface is visible, terminating posteriorly in the adhesion; and between those two spaces there is no communication whatever.

The results which follow the advent of a gumma in the fauces or pharynx may be comparatively insignificant, such as the loss of a small portion of the uvula, of one of the tonsils, or of one or other of the pillars; but where the gumma has penetrated deeply, and it usually does so, the result is a permanent breach of surface, interfering with the function of the part. This is most evident, and it occurs most frequently, in some parts of the palate. In the majority of cases the perforation is single, and after the raw surface has healed, the size of the opening may be

greatly reduced by contraction of the cicatricial tissue surrounding it. Occasionally a series of gummata may be met with deposited in line along the middle of the palate. When the intervening tissue remains healthy, a series of perforations result. Such a case in its early stage I had referred to me by Dr. MacDougall of Girvan, in which there were three perforations in a line, due to the liquefaction of three separate gummata. As a rule, however, where gummata are multiple the tissues separating them become inflamed and slough, with the result that the palate—both the hard portion and soft—is more or less completely destroyed. An illustration of this I have been able to show to students during several sessions in a woman from Greenock, who, as a result of this destructive process, sustained the loss of the whole palate.

In the larynx where, as a result of ulceration, a portion of one vocal cord has been destroyed, permanent huskiness follows. When the inflammation associated with the presence of an ulcer or a gumma is acute, there may be oedema of the soft tissues of the glottis, which may seriously interfere with respiration. The occurrence of oedema glottidis is specially associated with implication of the cartilages, and where the cartilages of the larynx proper have become necrosed, tracheotomy is frequently called for.

Following extensive ulceration in the interior of the larynx, great distortion of the organ may result after healing has occurred. The relations of the various parts may be entirely lost, and from the adhesion of opposing surfaces the air-way may be so narrowed as to endanger the patient's life.

Treatment.—Those affections of the throat which have just been described as of syphilitic origin must always be considered in their constitutional aspect, and should never

be treated as local lesions, and nothing more. Local treatment may or may not be necessary; constitutional treatment must be adopted in every case. As opposed to this statement, however, the practice of the late Sir Morell Mackenzie may be quoted. In his *Diseases of Throat and Nose*, vol. i., page 93, he says: "Secondary syphilitic affections of the pharynx do not usually require any constitutional remedies. For the last eighteen years I have seldom employed any specific treatment for adults. Under the use of local remedies the symptoms rapidly disappear, and I have rarely met with tertiary phenomena in the throat amongst those whom I previously treated for the earlier manifestations. Hence it is probable that the non-use of mercury does not increase the risk of a further development of the disease." With all deference to his authority, his teaching on this point I consider most dangerous. Fortunately it is supported by few, and the argument on which it is founded is not only incomplete but erroneous. As has been pointed out, secondary manifestations in the mouth and fauces, when the parts affected are free from local irritation, disappear *spontaneously* at the end of six, eight, or ten weeks, but the disease of which they are symptoms remains uncurbed.

Treatment then is divided into Constitutional and Local remedies, and these are sub-divided into Medicinal, Dietetic, Hygienic, and Operative measures.

1. **Constitutional.**—Of late years the experience of members of the profession in this country has led them to the conclusion that the syphilitic poison can best be combated by preparations of mercury and by the iodide of potassium, the former being most useful in the early stages, the latter in the late manifestations of the disease. The induration around a hard chancre disappears rapidly under the influence of mercury; and by its early exhibi-

tion secondary symptoms are distinctly modified, and may be averted. Similarly under the iodide, tertiary deposits dissolve and become absorbed, and tertiary ulcers are rendered healthy and are encouraged to heal.

Authorities are divided as to the relative efficacy of the various preparations of mercury and the best method of administering the drug. Mr. Hutchinson recommends Hydrargyrum cum cretâ as being the most constant and least variable of all mercurial preparations. He employs it in the form of pill, each containing one grain; and where necessary the grey powder is combined with one grain Dover's powder. One pill should be taken by the patient four times a day, or more frequently if called for. Plummer's, or the compound calomel pill (pilula hydrargyri subchloridi composita), is preferred by many, who prescribe it in five grain doses taken twice daily.

The bichloride of mercury in solution is largely employed, and this I prefer in dispensary practice, in a measure because it can be quickly and accurately dispensed, and the dose is readily regulated by taking a larger or smaller quantity of a standard solution. The B.P. solution (Liquor hydrargyri perchloridi) contains one-sixteenth of a grain in each drachm; but in prescribing it I prefer the solution freshly made, and I prescribe with it a small proportion of iodide of potassium, which, besides ensuring complete solution of the sparingly soluble mercuric salt, appears to render the mercury more active in combating the disease in the early secondary stage, in many cases. Again, where mucous patches are numerous, a condition usually associated with a copious papular eruption over the skin generally, the addition of arsenic in solution will be found distinctly beneficial, although it must be remembered that the exhibition of general tonics enables the system to resist the action of mercury.

Per contra the influence of mercury is most readily exerted and becomes rapidly evident when the patient is debilitated, is kept in bed, and on low diet.

In addition to these and other mercurial preparations which may be administered by the mouth, mercury may be given hypodermically—a method employed by comparatively few in this country—by inunction, or by fumigation.

A variety of preparations of mercury may be chosen for hypodermic use, of which the perchloride, simply dissolved in water, or with a small proportion of glycerine and iodide of potassium added, and the bicyanide are the more common. The former may be given, as recommended by Bloxam of the London Lock Hospital, in doses of $\frac{1}{60}$ of a grain per day, or $\frac{1}{3}$ of a grain at one injection, once per week, or, as directed by Lewin of Paris, in daily injections of from $\frac{1}{12}$ to $\frac{1}{8}$ of a grain. The bicyanide, preferred by many, may be given daily in doses of from $\frac{1}{16}$ to $\frac{1}{8}$ of a grain.

In administering mercury **hypodermically,** the needle should be inserted deeply and the injection made slowly into the muscle, in the gluteal region for instance, never into the subcutaneous cellular tissue. The action of the drug thus administered is more rapid than when given by the mouth, and it is of most service where early deep ulceration has taken place. The disadvantages of this method are that it necessitates daily medical attention, and that the injection is followed by considerable pain, which frequently lasts for hours, and by the occasional formation of abscess.

Fumigation though active is seldom employed, and **inunction** is used chiefly in this country in the treatment of children, or in adults when the internal administration of mercury gives rise to gastro-intestinal irritation.

The fame of Aix-la-chapelle as a resort for the cure of syphilis depends largely on the thoroughness with which treatment by inunction is carried out.

For the successful treatment of tertiary lesions of the tongue, palate, fauces, pharynx, and larynx, iodide of potassium is chiefly relied upon. Under its specific influence recent gummata become absorbed, or, where this does not take place, their destructive action is modified and limited, and foul ulcers assume a clean and healthy appearance. In using iodide of potassium for the treatment of syphilis it will be found that, in the great majority of cases, the beneficial specific influence of the drug is obtained from comparatively small doses, doses varying from 3 to 5 grains, repeated three or four times a day. Larger doses are but rarely called for, and should not be given without good reason. When it appears necessary to increase the dose it is often well to combine this salt with the iodide of sodium, or the iodide of ammonium along with aromatic spirits of ammonia. By such means the depressant action of the potassium salt is minimised, the patient is saved a large amount of discomfort, and the full effect of the drug employed is obtained. The iodides are as a rule best borne by those whose general health is good, so, when the patient is anaemic, iron may be advantageously given with it. Tartrate of iron with the iodide of potassium has long been a favourite prescription with Dr. Alexander Patterson, Surgeon to the Glasgow Western and Lock Hospitals, in doses of from $2\frac{1}{2}$ to 5 grains of each, and the combination, though not specially elegant as a pharmaceutical mixture, is most efficacious and much superior to, and much less liable to interfere with, the digestive organs, than the syrup of the iodide of iron.

In cases where the depressant action of the iodides is

severe and persistent, and in those cases where the tertiary phenomena do not appear to be readily controlled by their use, a return to some of the mercurial preparations already referred to should be made.

2. **Local.**—Though local medication must be looked upon as secondary to constitutional treatment in all syphilitic lesions of the mouth and throat, yet local applications should never be neglected, for by them discomfort and pain are readily removed, and necrotic inflammatory processes may be controlled, and the destruction of tissue prevented.

In the early erythema of the palate and fauces a single application of a solution of nitrate of silver (30 grs.—℥ j) always relieves and, frequently, completely removes the discomfort and irritation complained of. Should the injected condition persist, the frequent application of cocaine solution—most readily applied in the form of lozenge—is grateful to the patient, and removes the superficial congestion.

When mucous patches are present and painful, or where the surface has become eroded, local applications are called for. Strong solution of nitrate of silver (60 grs.—℥ j), or of sulphate of copper (30 grs.—℥ j), may be employed with advantage, or a solution of chromic acid (1 in 3) may be used, carefully confining the application of the pigment to the affected area. This, in my opinion, is the most satisfactory local remedy, and the comfort experienced by a patient after a single application, as well as the rapidity with which an erosion heals after such an application are often surprising.

When a gumma is present, painting the swollen surface with Lin. iodi. is sometimes of service, but care must be taken not to irritate the surface by severe or too frequent applications.

In the local treatment of tertiary ulcers it is necessary, in the first place, that the parts be kept thoroughly clean. This may be accomplished by the use of a mouth-wash or gargle of some antiseptic such as carbolic acid, chlorate of potash, permanganate of potash, etc., in solution. After the surface has been cleansed, if the ulcer is indolent and comparatively superficial, it may be stimulated by various pigments, such as solution of chloride of zinc, nitrate of silver (weak), sulphate of copper, etc. When the destruction is extensive or deep, and in those cases where the ulcer is spreading, the action may be checked in most cases, and a healthy condition of the part induced, by the application of the actual or galvano-cautery over the raw surface. When this is not available, the surface may be touched lightly with acid nitrate of mercury, or solution of chromic acid (1 in 3) may be employed.

3. **Dietetic and Hygienic.**—It is of considerable importance, both for the comfort of the patient and to obtain the best results from medicinal treatment, that everything which might irritate or inflame the parts be carefully avoided. Thus, while the palate, fauces, or pharynx are inflamed, the diet should be bland in character, spiced and hot foods should be specially avoided, and the use of both alcohol and tobacco must be strictly forbidden. Rest of the voice is necessary, and should be enjoined when the larynx is affected. Where there is much swelling of the parts, giving rise to difficulty in deglutition, or where, from loss of tissue, such as perforation of the hard palate, destruction of portions of the soft palate, etc., fluids, while being swallowed, return in part by the nose, deglutition may be rendered much more agreeable, and feeding an easier task by giving food of a semi-solid character. Farinaceous food, such as arrow-root, of the consistence of stiff paste, is readily swallowed

by those who cannot take fluids like milk or brown soup without a large proportion returning through the nose. After each meal the mouth must be thoroughly cleansed by rinsing with a solution of chlorate of potash, borax, or the like; and every care must be taken while abrasions of the lips and tongue persist to avoid all risk of communicating the disease to others. While taking mercury, patients should abstain from fruit, fresh vegetables, tea, and coffee, as these are apt to cause intestinal irritation and diarrhoea.

4. **Operative.**—Under certain circumstances it becomes necessary to resort to surgical measures to prevent the patient being suffocated or to enable him to partake of food. During the presence of extensive ulceration, for instance, oedema glottidis may supervene, and tracheotomy may be called for. Following extensive ulceration, the palate, fauces, and pharynx may become bound together, so that not only may all communication between the buccal and nasal cavities be cut off, but the faucial isthmus may be so narrowed as to interfere with alimentation, as in cases already cited.

In all such cases one should never be tempted to enlarge the isthmus by the use of the knife, as from contraction of the resulting cicatrices the patient's condition subsequently is only aggravated. Where contraction is extreme the parts may be dilated by stretching in various ways, and where respiration is interfered with, the trachea should be opened previous to any attempts at dilating the faucial cicatrices. The inconvenience of a perforation in the hard palate can be readily overcome by an obturator where the opening is small, and a vulcanite or metallic plate may be readily adapted by a dentist when the destruction is more extensive.

Where there is narrowing of the calibre of the larynx

following extensive ulceration, or where, from destruction of some part of the cartilaginous framework the larynx has become distorted and respiration difficult, an O'Dwyer's tube of appropriate size may be inserted. Should its presence cause much discomfort, or tend to produce ulceration of the surface, it should be withdrawn, the trachea opened, and an ordinary cannula inserted. It may be necessary for the patient to continue to wear an appliance of this sort for a series of years, the length of time depending on the state of the larynx.

CHAPTER IX.

TUBERCULOSIS.

I. TUBERCULOSIS OF THE PHARYNX.

DEPOSITS of miliary tubercle and tubercular ulcers occur in the pharynx without doubt, and although *apparently* primary in some cases, they are usually, if not in all cases, secondary to pulmonary tuberculosis.

Though authors are by no means agreed as to why the pharynx specially should become so affected, I have the conviction that the implication of the region is in great measure the result of the coughing associated with pulmonary phthisis. From incessant coughing the pharyngeal wall is kept in a constantly inflamed condition, and during each cough the sputum, laden with tubercle bacilli, is thrown violently against this inflamed and frequently eroded mucous membrane, with the result that the surface becomes inoculated.

Symptoms.—The subjective symptoms are those of pulmonary phthisis, with which pharyngeal tuberculosis is almost always associated. But, in addition to cough, muco-purulent expectoration containing tubercle bacilli, loss of appetite, loss of flesh, night-sweats, evening-exacerbations of temperature, etc., there is complaint of constant pain or sense of rawness in the throat, and

this is greatly increased on swallowing. This point is an important factor in prognosis, as from the great pain associated with deglutition the patient is unable to take the requisite amount of nourishment, and thus he becomes exhausted much more rapidly than in uncomplicated pulmonary phthisis.

Pharyngeal tuberculosis almost invariably occurs in adults; and the lesions most frequently make their appearance on the lateral walls of the pharynx, from which they spread in all directions. The ulcers at first small and somewhat oval, become larger and of irregular outline from the coalescence of neighbouring ulcers, their edges are thickened, inflamed, undermined, and frequently studded with more recent tubercular deposits, which in turn break down rapidly and increase the area of ulceration. The ulcer is usually covered with greyish ropy muco-purulent secretion, on the removal of which, by swab or otherwise, a surface composed of unhealthy granulation tissue is exposed. The ulcerative process is comparatively superficial. Though there are several points of marked difference between tubercular and syphilitic ulceration of the pharynx, yet the former is apt to be mistaken for the latter, which is so much more common. However, the presence of high temperature, the extreme if not characteristic pain on deglutition, which shoots sharply up towards the ears, the condition of the lungs, and lastly, the demonstration of tubercle bacilli in the secretion covering the ulcer, will remove all doubt as to the nature of the ulcers.

Prognosis is always unfavourable, and the rapidity of a fatal issue depends largely on the degree of dysphagia in any given case.

Treatment may be summed up in a few words. It comprises:—(1) Rest of the part affected; (2) a plentiful

supply of suitable nourishment; (3) local applications for the relief of pain and to stimulate the healing process; and (4) choice of a suitable climate, all of which will be considered more in detail under "Laryngeal tuberculosis."

II. TUBERCULOSIS OF THE LARYNX.

Tubercular Laryngitis, or phthisis laryngea, is much more frequently met with than tubercular disease of the pharynx and fauces, and in the great majority of cases it occurs secondarily to pulmonary tuberculosis. That it ever occurs as a primary disease is denied by some and questioned by many; but all are agreed that cases occur where tubercular disease is seen in the larynx before its presence can be detected in the lungs, *i.e.*, where the lungs on careful examination appear perfectly sound. Those who deny that tubercle ever affects the larynx primarily, say of such cases that though it may not be discovered by physical examination, tubercle is present in the lung in all cases.

The portion of lung involved may be comparatively limited, the lesion situated deep in the substance of the lung and of old standing, or of such a chronic character as to cause no change which can be detected by the physician. It is difficult to deny this allegation, and especially in face of the fact that in almost every case (and the exceptions are very few) where death has occurred and a careful post-mortem examination been made, it has been found that when true tubercular ulceration of the larynx existed the lungs were similarly affected; and not only so, but the lesions there found appeared of longer standing than those met with in the larynx. The following notes of a case will serve to illustrate the difficulty of determining when the primary lesion is in the larynx

or lungs. A carter, aged 19, suffering from hoarseness, with increasing difficulty in respiration, during the previous two weeks, came under my care at the Western Infirmary. On laryngoscopic examination the epiglottis and right arytenoid prominence were seen to be markedly oedematous, and so much enlarged as to preclude other portions of the larynx being viewed. He was passed into a surgical ward as an urgent case. There under sedative inhalations the oedema subsided, but not completely as in a simple catarrhal laryngitis, and though neither deposit nor ulceration within the larynx, nor any indication of pulmonary implication could be detected, it was diagnosed as a case of early and apparently primary tubercular laryngitis. After three weeks' treatment in hospital, he was sent to a convalescent home in the country, but before the end of the third week of his residence there, he returned to hospital again suffering from dyspnoea. Oedema had recurred, and over the surface of the oedematous epiglottis and arytenoid prominences there were numerous small white ulcers. Dysphagia, as well as dyspnoea, was now complained of. Evidences of tubercular mischief in the lungs soon became manifest, and he died of exhaustion at the end of eight weeks. At the post-mortem examination performed by Dr. Coats, several cicatrices and some small old cavities were found in both apices, and there was also widespread recent tuberculosis of both lungs—the initial and the final stage, but nothing intermediate. The explanation seemed to be that the old tuberculosis had led to involvement of the larynx, and that when the laryngeal disease went on to ulceration there was dissemination through the lungs by insufflation.

But though the disease is seldom, if ever, confined to the larynx, when the parts are examined post-mortem, owing to the infrequency with which tubercular laryngitis alone

causes death, yet a fair number of cases are met with where true tubercular laryngitis is present without pulmonary implication, or at least where the pulmonary involvement is so slight as to baffle detection. And when we think of the situation of the larynx, we should expect primary tubercular laryngitis to be of frequent occurrence rather than an exceptional condition. From its comparatively superficial position, the larynx is exposed to, and readily influenced by, changes in temperature. All air inspired passes through the larynx, and, as a result, its lining membrane also must be influenced by the condition of the air as regards temperature, humidity, and presence of impurities. The readiness and frequency with which the parts become congested by the prolonged or forcible use of the voice, or by inflammation of the structures immediately surrounding it, the occurrence of which is a matter of daily experience, tend to produce sub-acute congestions and inflammations, which in those of the tubercular diathesis would be expected to become the seat of tubercular deposit, resulting in a true tubercular laryngitis. From my own observation and from the reports of others, I am of opinion that tubercular laryngitis does occur prior to and apart from implication of the lungs, but that such cases are rare.

The larynx, on the other hand, is affected in a very large proportion of those suffering from pulmonary tuberculosis. The affection of the larynx, however, is not necessarily tubercular, as a patient, while suffering from pulmonary phthisis, may contract a simple catarrhal laryngitis which under appropriate treatment will get well. Schäffer, in reporting the results of a laryngoscopic examination of 310 persons suffering from pulmonary tuberculosis, stated that in eight cases only did he find the larynx normal, while Sir Morell Mackenzie found in the examination of 100 phthisical patients 29 cases in

which the laryngeal mucous membrane appeared normal, and in the remaining 71 he found organic changes present in the larynx.

The percentage of cases in which laryngeal ulceration has been found in the post-mortem examination of those who had died from pulmonary phthisis given by different authors also varies between those of Williglk, with 13·8 per cent. in 1317 cases, and Heinze, with 30·6 per cent. in 1226 cases examined.

The **symptoms** associated with tubercular affections of the larynx vary according to the stage of the disease, the parts involved, and the severity of the local process.

Local Disturbances.—Interference with the vocal function is present in varying degrees in 90 per cent. of all cases of laryngeal phthisis. At a very early stage the patient finds that, after comparatively slight use of the voice, there is a sense of **fatigue** of the larynx, accompanied by a slight degree of huskiness, and, should the use of the voice be persisted in, whether it be in speaking or in singing, or should attempts be made to clear the voice by coughing, the **hoarseness** increases. As the local manifestations of the disease become more pronounced, the voice is more seriously interfered with, and from occasional huskiness it may proceed to persistent hoarseness or complete loss of the voice—**aphonia**.

The causes which lead up to such a result are various, those of most common occurrence being a relaxed state of the mucous membrane covering the vocal cords, laryngeal catarrh, which, when associated with the tubercular state, is of a persistent character, fulness of the ventricular bands, infiltration of the inter-arytenoid fold, and swelling or ulceration of the vocal cords.

Cough, which depends greatly on the condition of the lungs, is, in the early stage, neither a characteristic

symptom, nor is it constantly present. As the disease advances the cough becomes more troublesome, and, in the later stages, violent and exhausting paroxysms frequently occur.

Expectoration, at first mucous in character, becomes muco-purulent, and, where laryngeal ulceration exists, it may be streaked with blood, and the expectorated matter will, on careful examination, be found, in the majority of cases, to contain tubercle bacilli. As the ulcerative process advances, the closure of the glottis during coughing may be incomplete, and this condition, combined with the reduced state of the patient's strength, renders dislodgment of the discharge difficult, the attempts frequently ending in vomiting.

Dyspnoea.—Shortness of breath is present to a varying degree in the advanced stages of all cases as a result of the condition of the lungs, but dyspnoea may occur at an early stage, and may indeed be the first symptom, as a consequence of the laryngeal affection. When this is the case, the respiratory difficulty is almost always due to oedema of some part of the larynx, it may be of the epiglottis, of the arytenoids, or ary-epiglottic folds, of one or other ventricular band, or it may be subglottic.

Dysphagia.—Deglutition is interfered with in about one-third of all cases of laryngeal phthisis. The difficulty at first is due to the pain, often felt most acutely as shooting to the ear, accompanying each act of swallowing, and this **odynphagia,** resulting from the inflamed state of the larynx, or from the presence of ulcers, is occasionally so severe as to seriously interfere with nutrition.

Dysphagia proper is usually a late symptom, and the difficulty or obstruction is due to swelling—infiltration or oedema—in connection with the epiglottis, or the arytenoid prominences. In more advanced cases where, on

account of destruction of tissue, the opening of the larynx is not sufficiently protected during swallowing, a portion of the food, on its way to the oesophagus, may enter the larynx, resulting in a paroxysm of coughing, or in dyspnoea. On the other hand, it is astonishing to observe, in some cases, how the parts accommodate themselves to the new order of things, and to note with what ease, or rather complete absence of discomfort, a patient can swallow, after a large portion of the epiglottis has been destroyed by ulceration. Such is of much more common occurrence, however, in syphilitic .than in tubercular ulceration. Where this imperfect closure of the larynx exists and interferes with deglutition, it is well to bear in mind the ease with which semi-solids are swallowed compared with either fluids or solids.

The **general symptoms** which are associated with, and characteristic of, pulmonary tuberculosis are present in laryngeal phthisis, and they are more or less marked according as dysphagia is present or absent. Where it is present, general nutrition is quickly affected, and with the rapidity of the wasting process the various symptoms indicative of bodily exhaustion supervene at an early stage of the disease. Thus laryngeal phthisis, which, at its commencement may appear so slight as to throw doubt on the diagnosis, frequently proves much more rapidly fatal than cases of pulmonary phthisis, which run their course without laryngeal complication.

When a **laryngoscopic examination** is made, the appearances presented by the parts are found to be quite as varied as the symptoms which have been enumerated. These various conditions will be considered as far as possible in the order of their occurrence, and the local lesions according to the frequency with which they are encountered.

Anaemia.—Pallor of the mucous membrane of the larynx occurs universally in the early stage of phthisis, and in many cases it may be observed long before the general health has become appreciably affected. This laryngeal anaemia is frequently in marked contrast to the state of the buccal and faucial mucous membrane, the colour of which may appear changed but little if at all. The occurrence of this profound local anaemia, out of all proportion to anything which may exist in adjacent mucous surfaces, is always suspicious of early phthisis, and the symptomatic importance of this condition is increased by the occurrence of one-sided local hyperaemia; for instance, an area of injection localised to one vocal cord or to a portion of one cord. How far the lack of an efficient local blood-supply may, by lowering the vitality of the part, predispose to tubercular deposit, is an open question; but that the condition occurs as a precursor of tubercular deposit is undoubted, and when present, the lungs should be very carefully examined.

Catarrh.—Slight swelling, with general injection of the laryngeal mucous membrane may occur in one suffering from pulmonary phthisis, but it may be simple in nature (non-tubercular), and, under appropriate treatment, may entirely, though slowly, disappear. This occurrence is not uncommon in those the subjects of pulmonary tuberculosis, and may be due to the diminished power of resistance on the part of the larynx. When it does occur, the most marked feature is its chronicity; it is much more obstinate than a simple catarrh in a healthy individual, and in some cases it is followed by tubercular deposit and ulceration.

Paresis, or imperfect movement of the laryngeal muscles, resulting in incomplete closure of the glottis during attempted phonation, is met with in the early stages of

laryngeal implication, and is usually bilateral. This may, in great measure, result from disturbances of innervation, associated with anaemia and catarrh, or from changes in the contractile substance of the muscles, a condition found by Fränkel to be associated with tuberculosis.

Paralysis occurs but rarely in tubercular laryngitis, and when not the result of intra-laryngeal infiltration, is due to pressure exerted on the recurrent laryngeal nerve. It has been said, but I fear on insufficient grounds, that when unilateral, the paresis and paralysis occur on the same side as the pulmonary disease.

Changes in the Inter-arytenoid Membrane.—In my opinion it is in this locality that the earliest definite indication of tubercular disease of the larynx is to be observed. And the earliest change noticeable is in the form of swelling and softening of the mucous membrane on the laryngeal aspect of this fold. The affected surface becomes of a grey or ashy colour, resembling mucous membrane which has been softened by steeping in some fluid. This occurs long before there is any appreciable thickening of, or other evidence of infiltration in, the inter-arytenoid fold as a whole ; but it is none the less pathognomonic, and is due, I think, to the presence of tubercle bacilli, or early and infinitesimal deposits in the submucosa. It should not be looked upon, like anaemia, as a pre-tubercular stage, but as an actual tubercular lesion. I had long expressed my belief in discussion and in clinical demonstrations that this was the case, but was unable to have it corroborated by a post-mortem examination of the part in the early stage. However, within very recent times, the nature of this lesion has been amply proved, and a few particulars of the first case under my own observation may be of interest. **Two cases** of phthisis were admitted to the

wards of Professor Gairdner to undergo treatment by the subcutaneous injection of Koch's tuberculin, and previous to the commencement of the treatment I was requested to examine and report on the condition of the larynx in each case. In one there was general anaemia of the laryngeal mucous membrane without any localised lesion; but the second case, a man aged 24, presented the condition under consideration—swelling and softening of the mucous membrane on the laryngeal surface of the inter-arytenoid fold—but to so slight an extent as to be unaccompanied by any symptom, such as huskiness or pain, to indicate its presence. In my report, dated 5th January, 1891, after describing the appearance of the parts, I remarked that if the hoped-for reaction took place, *i.e.*, if Koch's tuberculin was able to search out and excite inflammatory action in any part where tubercle was deposited, I would expect the inter-arytenoid fold to become inflamed and swollen, and voice and possibly respiration to be interfered with. Treatment was begun by the injection of one mm. of the fluid daily, and this was gradually increased till the 17th, when 7 mm. were administered, following which injection he experienced a "sharp pain on the left side of his throat, which interfered with respiration." This pain increased until 2nd February, by which date the dose had been increased to 22 mm., when I again examined him. The inter-arytenoid fold was then found to be highly inflamed, much swollen, and oedematous, though there was no ulceration of the surface detected, and voice and respiration were both seriously implicated. "This swelling," to quote from Dr. Gairdner's report, "of the inter-arytenoid membrane was accompanied by so much soreness and difficulty of swallowing that it led to the discontinuance of the injections for a time at least."

Where the tubercular **infiltration** of the inter-arytenoid

membrane is more marked than that described, the fold appears as a smooth rounded swelling, and its presence so interferes with the approximation of the vocal cords as to produce aphonia, or it may even, from its size, interfere with respiration. As the infiltration increases, the covering epithelium is raised from its limiting membrane, it becomes fissured, small portions become necrosed, and these portions, along with broken-down tuberculous material, are cast off and leave a raw surface.

Where **ulceration** of the inter-arytenoid membrane has occurred as a result of the breaking down of the deposits, it takes the form of a ragged deep ulcer, which is covered with muco-purulent secretion. From the surface of such an ulcer the granulations occasionally become exuberant,

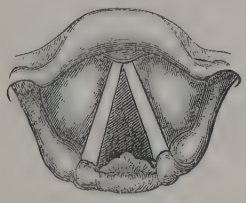


FIG. 26.—Mammilloid growth springing from the upper border of a tubercular ulcer of the inter-arytenoid membrane.

and form a sessile growth which not only interferes with the approximation of the cords, but obscures the ulcerated surface below. Perhaps one reason why the ulcer in this region tends to become deeper and its surface more prone to the formation of granulation tissue than is the case with tubercular ulcers elsewhere, is that this membrane is seldom at rest. During phonation, during respiration, and during deglutition, the inter-arytenoid fold is either on the stretch or is more or less contracted, rarely remaining for any length of time in one position.

Tubercular infiltration of one or both *ventricular bands*

occurs perhaps next in frequency. The whole band becomes swollen, and from its increased size may obscure the vocal cord beneath, and occasionally interfere with its movements. When both are affected they may meet in the middle line during attempted phonation, and so render the voice rough and husky.

Similar infiltration may affect the *arytenoid prominences*, when they appear, if both are affected, as two large pyriform swellings lying in contact with each other posteriorly, so that the inter-arytenoid space is obliterated. The *ary-epiglottic folds* and the *vocal cords* may each be the seat of tubercular infiltration, though less frequently than the parts enumerated. In the former, the infiltration is generally one-sided. Infiltration of the vocal cords is also, in the early stage, usually unilateral; the affected cord is thickened, and in place of being a flat white band, it becomes rounded and red, and the outline of its free border uneven.

Areas of infiltration may also be met with over the surface of the *epiglottis*, its free border and the sides where they are joined by the ary-epiglottic folds being most frequently affected. Infiltrations here, as in other parts of the larynx, may, and most commonly do, occur in circumscribed patches, though occasionally the greater part, or the whole of the epiglottis may be involved so as to alter, in a marked way, the form of this part of the larynx.

These infiltrations, wherever they occur, tend to break down, and result in the *formation of ulcers*. The characteristic ulcer, as met with in the inter-arytenoid fold, has already been described. Those occurring elsewhere in the larynx, as the result of breaking down of circumscribed tubercular deposits, are, at first, small, grey, somewhat crater-like ulcers, usually multiple, but after

a time forming, by coalescence of neighbouring ulcers, irregularly-shaped flat sores with undermined edges. Such ulcers may be surrounded by secondary deposits, and their presence is almost always complicated with oedema. Oedema is met with most frequently in the loose tissue over the arytenoids, of which one or both

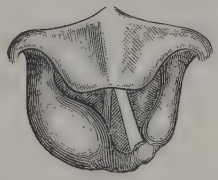


FIG. 27.—Oedema of the right arytenoid prominence in a case of early phthisis laryngea.

may be affected; in the ary-epiglottic folds; and in the epiglottis (see fig. 11, p. 44), though any part of the larynx may be so affected.

When the ulcerative process is acute and the destruction of tissue extensive, *perichondritis* may supervene, resulting in necrosis of portions of the cartilages, which may exfoliate. In acute perichondritis, the swelling associated with the formation of pus may be so great as to threaten suffocation.

In the **diagnosis** of tubercular laryngitis there is occasionally room for doubt. In a typical case, where the appearances of the inter-arytenoid fold, as described, or the pyriform swelling of the ary-epiglottic folds is present, there should be no uncertainty as to the cause; but where the local appearances are less definite, the condition is apt to be confused with that the result of a chronic laryngitis or with lesions due to syphilis.

The **swelling** occurring as the result of chronic catarrhal laryngitis, which is general rather than localised, is usually less marked than that caused by tubercular infiltration,

and it is accompanied by hyperaemia of the whole lining membrane of the larynx. As the difficulties in differentiation chiefly lie between syphilis and tubercle, it may be well to tabulate the principal points by which they may be distinguished.

Tubercular Laryngitis.	Syphilitic Laryngitis.
Swellings from tubercular infiltration are usually pale.	Syphilitic deposits (gummata) are red and angry.
Tubercular ulcers are small in size, comparatively superficial and multiple.	Syphilitic ulcers are usually single, irregularly circular in form, and frequently deep.
Tubercular ulcers may remain quiescent for a lengthened period, or spread but slowly.	Syphilitic ulcers extend rapidly.
Irritability of the fauces is almost always present, and frequently so great as to render a laryngoscopic examination impossible without the use of a local anaesthetic.	Tolerance of manipulation is a marked feature in most cases.
The lungs are affected in the majority of cases, and other signs of phthisis are usually present.	There is an absence of symptoms suggestive of tubercular disease.

Scars in the fauces and pharynx, bearing evidence of former ulceration, suggestive of syphilis, and the presence or absence of tubercle bacilli in secretion removed from the surface of the ulcer, will greatly aid in arriving at a definite diagnosis. The effect of Koch's tuberculin would certainly clear up the diagnosis in a doubtful case, but the use of such means cannot be recommended. It must also be borne in mind that a phthisical patient may have contracted syphilis, and that the ulcers to be dealt with are syphilitic in character, just as a patient who has had syphilis may, apart from that disease, develop phthisis.

Prognosis is at best doubtful, and in the majority of cases most unfavourable. When the lesion is, in the early stage say, confined to the inter-arytenoid membrane and the lungs are apparently sound, healing, under appropriate treatment, may take place, and by subsequent suitable climatic conditions something akin to a cure may follow. The same satisfactory result may be obtained when the ulcers are small, unaccompanied by oedema, when deglutition is not interfered with, and the general health is fairly good; but even if healing has taken place relapses may at any time occur, or the patient may develop pulmonary phthisis of a more or less acute type. Oedema from tubercular infiltration, when ulceration has not occurred, may remain *in statu quo* for a lengthened period; and if the pulmonary condition is good, or the lung disease is in an incipient condition, life may be prolonged for years. On the other hand, where ulceration has taken place, if the ulcers are numerous, or if, by coalescence, the ulcerated area is extensive, this being accompanied by copious secretion, and difficult and painful deglutition, strength becomes rapidly exhausted, and death occurs within a very short time. As has already been observed, cases of laryngeal tuberculosis in which dysphagia is a marked symptom prove much more rapidly fatal than pulmonary phthisis uncomplicated by laryngeal mischief.

Treatment.—The necessary treatment may be conveniently considered under Constitutional, Local, and Surgical measures.

Constitutional.—These are in great part identical with the measures adopted in cases of pulmonary phthisis, and include (*a*) the **administration of medicines**, given with the object of counteracting the phthisical cachexia, increasing general nutrition, and relieving urgent symptoms.

Chief amongst the tonics are preparations of iron, quinine, arsenic, the hypophosphites of lime and soda, and cod-liver oil.

Urgent symptoms must be relieved on general principles, as they arise.

(*b*) **Diet** is all-important, and where there is no interference with deglutition the patient should have a large choice of readily digested, nutritious food, plainly cooked, free from irritating condiments: and meals should be taken regularly. When deglutition is painful, or when, on account of loss of tissue, consequent on ulceration, food tends to enter the larynx while passing towards the gullet, it will be found that semi-solids (milk and soups, thickened with arrow-root, isinglass, etc.) are more readily swallowed than fluids, and these should not be sipped, but swallowed in quantity.

Another method by which this difficulty may, in a measure, be overcome is by the patient lying prone on a couch and sucking the food through a tube. Again, if pain is so severe as to interfere with the taking of food in sufficient quantity, or if the patient prefers to do without food rather than suffer the agony associated with the act of deglutition, a local anaesthetic may be applied prior to swallowing. To this end the larynx may be sprayed with a ten per cent. solution of cocaine, or a cocaine lozenge or pastille, containing from $\frac{1}{8}$ to $\frac{1}{4}$ of a grain may be used immediately before food is taken, or morphia ($\frac{1}{6}$ gr. of the acetate combined with starch or boracic powder) may be puffed over the raw surface, one hour before meal-time.

(*c*) **Hygienic Surroundings.**—Clothing, warm without being weighty, and regulated exercise must all be considered.

(*d*) The question of **climate** is fully discussed in articles

on phthisis pulmonalis in many of the text-books on general medicine, so that here the subject need not be considered further than to state the essential features of the climate to be chosen, which are (1) "pure air, free from dust and organic particles; (2) abundance of sunshine without excessive heat, so that much time can be spent in the open air; (3) a temperature with few extremes; (4) absence of, or sheltered from, violent winds" (Sparks).

Local Measures.—(*a*) Rest for the larynx should, in all cases of tubercular laryngitis, be insisted upon. The patient should be instructed to abstain from speaking as much as possible, and, when speech is absolutely necessary, whispering alone should be employed.

(*b*) **Sedative Inhalations,** such as hops, conium, etc., in conjunction with steam, are sometimes useful, especially in the early stages when the frequent tickling cough is annoying; but they should be used with caution, as such moist inhalations tend to hasten the breaking down of tubercular deposits.

(*c*) **Dry Inhalations**—iodine, creasote, carbolic acid, chloroform, etc.—on an oro-nasal inhaler, form useful adjuncts to other treatment. In prescribing these it must be remembered that a very small proportion only of the antiseptic employed reaches the larynx or the bronchi, as the volatile active ingredient is to a large extent absorbed by the moisture on the surface of the tongue, cheeks, fauces, pharynx, etc., and is swallowed or expectorated.

(*d*) The **direct application** of various antiseptics has of late been much resorted to, and of these iodoform with boracic acid, iodol, glycerine of carbolic acid, lactic acid, and menthol, are the chief. Those first enumerated have in great measure been discarded in favour of the two latter.

Lactic acid was introduced by Krause, who recommended the interior of the larynx to be swabbed with a 20 to 80 per cent. solution, the application to be made by means of a brush or cotton swab daily or at longer intervals according to the effect. Though spoken of highly by many, my experience of it in larnygeal phthisis, when it frequently aggravated the local lesions, has been such as to cause me to advise against its use. Far other is it with the treatment by menthol, first suggested by Rosenberg, and to the development of which I have devoted much time in dispensary practice and in the Western Infirmary, where through the kindness of many of my colleagues I was enabled to employ it over a lengthened period in cases of tubercular disease of the larynx and lungs in almost every stage. Dr. John Burns was, as far as I am aware, the first to employ it in Glasgow, and the relief afforded in his first case was so marked that I at once, on his recommendation, adopted it, and have used it extensively since. The solution which, after using a variety of combinations, I have found most agreeable to the patient and most efficacious in tubercular laryngitis, is 12 to 15 per cent. menthol, 2 to 4 per cent. guaiacol dissolved in olive oil or paroleine. (Guaiacol, which is contained in beechwood creasote to the extent of 60 to 90 per cent., has all the properties of creasote, is devoid of its, to some, disagreeable odour, is a much more powerful germicide, and is of definite composition.) The solution is applied *not* by a swab over the ulcerated surface, but by means of a syringe, the solution being injected *through* the larynx into the trachea and bronchi. The syringe may vary in capacity, holding from 25 to 40 minims, and the vulcanite laryngeal tube attached should be of equal calibre throughout, and should terminate in a single aperture only. In the administration of the injection I invariably employ the laryngeal mirror

by the aid of which the point of the laryngeal tube of the syringe can be accurately guided over the epiglottis and into the larynx without coming into contact with the tongue, the fauces, or the pharynx, thus obviating all risk

Fig. 28.—Syringe and Author's tubes for the intra-laryngeal injection of solutions of menthol, etc.

of retching being induced. After a little practice, however, the tube in the majority of cases can be readily inserted, and the injection given without the aid of the

mirror, by placing the patient before a good light, having his tongue held in the protruded position with the mouth widely open. The ease with which the tube can be introduced within the larynx depends greatly on the shape and position of the epiglottis. Where it is elongated and dependant it will be found necessary to resort to the use of the frontal and laryngeal mirrors, with, it may be, a specially curved tube, the point of which, in place of being at right angles to the stem, is bent to a more acute angle, as represented by the spare tube in fig. 28. The point of the laryngeal tube should be inserted *within* the larynx to the level of the vocal cords at least, and it should be in that position before the fluid is injected. If this is not attended to, and the fluid is spread over the cords, the sensation resulting is disagreeable, and similar to that experienced when something is said to have "gone the wrong way," and coughing may be excited. If, however, the nozzle of the syringe be placed at or below the level of the cords, the fluid is injected directly through the larynx into the trachea, and as much as two drachms in most cases can in this way be injected without the slightest inconvenience to the patient. Using a syringe which contains 25 or 30 minims, the injection may be repeated three or four times at each sitting, thus giving roughly from a drachm and a half to two drachms ; and applying it in this gradual way, coughing is rarely induced, as it is when a larger quantity is injected at one time.

Menthol is (1) a local anaesthetic, (2) a powerful stimulant, and (3) a highly volatile antiseptic. By its use as described we obtain the full effect of these qualities. On account of its anaesthetic properties relief from cough follows its introduction, and this in a way greatly to be preferred to the use of morphia locally, or the older fashion

of administration of opiates by the stomach, with their consequent deleterious effects on alimentation. Its stimulating qualities need not be here referred to, further than to mention their efficacy when the lungs are seriously involved; but its antiseptic properties, rendered more powerful by the addition of guaiacol and more serviceable by its volatility, are of the first importance. The oily solution having been introduced into the trachea and bronchi, the active ingredients slowly volatilise and are borne over the affected larnygeal surface with each expiration, thus surrounding it with an antiseptic atmosphere, the odour of which can readily be detected in the breath, six, eight, or ten hours after the injection has been given. The oil is, I suppose, partly absorbed, but the bulk of it is driven upwards through the bronchi and trachea, along with the mucous secretion, by the cilia of the epithelium towards the larynx, from which it readily enters the gullet. Though healing frequently occurs under its influence, menthol cannot be considered to be a specific in the cure of tubercular lesions. In many cases the ulcerative process continues to extend while it is being employed, but even in these the patient almost invariably obtains some measure of comfort from its use. The relief obtained from the irritating cough, with the consequent rest to the larynx, is perhaps the most marked result, and that for which the patient is most grateful. Personally, I have obtained favourable results from its use as here described, in a very much larger proportion of cases than from any other form of treatment; but though I have frequently attempted to classify the cases in which improvement might be expected, I have found it impossible to lay down any hard and fast lines. In some apparently favourable apyretic cases ulceration has steadily progressed, while in other cases, with extensive ulceration associated with rapid wasting, high

fever, etc., healing has occurred. As an example of healing of extensive tubercular ulceration of the larynx, the following, which is one of several cases which have been published in *Glasgow Medical Journal* and *British Medical Journal*, may be given :—

Peter M'L., aged 33, was admitted to the Western Infirmary on 29th November, 1889, complaining of hoarseness, with pain and difficulty in swallowing, of nearly three months' duration, but much aggravated of late. On laryngoscopic examination it was found that both ary-epiglottic folds and the epiglottis were deeply injected, the ventricular bands were inflamed and thickened and the inner edge of each eroded. The vocal cords were deeply injected, and the free edge of each was ulcerated throughout the greater part of its length. The vocal cords moved with difficulty on account of the degree of inflammatory swelling. In the examination of his chest, percussion appeared to be equal over both lungs, but the respiratory murmur was feeble all over the right side in front, with occasional clicking râles under the right clavicle ; and the sputum contained an abundance of tubercle bacilli. Three days after admission he weighed 10 st. 12 lbs., and his weight steadily increased from that date till 14th February, when previous to being dismissed he registered 12 st. $4\frac{3}{4}$ lbs., a gain of 1 st. $6\frac{3}{4}$ lbs. in eleven weeks.

Previous to admission to hospital he was losing flesh rapidly, had profuse night sweats, and sleep was much broken by the constant tickling cough and by the dry and painful feeling in the larynx. After the first few days of the menthol injection this was altogether changed ; he slept undisturbed the whole night long, and in reply to a query on this point, he replied that "if he continued to progress as he had done he would shortly become a

second Rip Van Winkle." The laryngeal ulceration entirely healed, as was witnessed by several medical gentlemen, and his voice was restored to its normal degree of clearness. In the Infirmary he was in a ward under Dr. Coats' care. Dr. Coats had examined the larynx several times, and, in reply to a request for an expression of opinion on the case, he wrote, "I regarded it as a distinct case of tubercular ulceration of the larynx. He improved in his general condition while in the ward, and the local lesion virtually healed." The condition of his chest was also distinctly improved. He returned to work, which he attended to more or less regularly for two years. At the end of that time he again came to the Infirmary complaining of cough and pains over the chest. His voice had remained good, and there was no evidence of mischief within his larynx. There was, however, tubercular deposit in both lungs, for the treatment of which he was again admitted to one of the medical wards.

Surgical Measures.—It has been suggested, and the suggestion has been carried into practice by some, that tubercular deposits and ulcers should be treated in the same way as tubercular glands and tubercular ulcers of the skin, namely, by destroying or scraping away the diseased tissue, which may be done by means of a modified Volkmann's spoon, or by the galvano-cautery. But though in this way, after the removal of the tuberculous tissues, a healthy sore should result which might readily heal, the swelling following such drastic proceedings would probably be so great as to render preliminary tracheotomy a wise precaution, and this step is the most serious drawback to the scraping operation, for, as will be shown, tracheotomy in such cases imperils the safety of the lungs.

When oedema is present, and so situated or so extensive as to cause dyspnoea, or threaten suffocation, warm inhala-

tions should, in the first place, be employed. If the oedema were simple in character, scarification of the surface with a laryngeal lancet would be followed by relief, and should be practised, but when it is associated with local tubercular disease, such a measure does more harm than good—the small incisions lead to the formation of ulcers, and the laryngeal inflammation is aggravated. Relief to breathing, when inhalations fail, may be given by intubation or by tracheotomy. The former, theoretically, is the better method, but is disappointing in practice, as from the irritability of the parts, the tube is, while in position, the source of constant irritation, producing coughing and retching, which are only relieved by its expulsion. Where it is retained erosion of the laryngeal surface from pressure readily results.

Tracheotomy, in tubercular disease, should only be employed where dyspnoea is urgent. The cause may be oedema, impaction of necrosed cartilage, etc., but in no case can the operation be considered as a curative measure, being palliative only, and performed to avert immediate suffocation. The wearing of the tube frequently causes considerable irritation in the wind-pipe, and in each of the few cases in which I have inserted it, rapid increase of the pulmonary symptoms has followed. The air taken into the lungs through the tube is not warmed, moistened, and robbed of floating particles as it is when taken through the nose or mouth, and notwithstanding the careful use of steam, the result is as I have stated. Nevertheless where dyspnoea is severe, the operation should be performed.

III. LUPUS.

Lupus, by which is meant a diseased state similar to that affecting the skin and described as *lupus vulgaris*, may

also attack the mucous membrane of the palate, fauces, pharynx, and larynx. As affecting these mucous surfaces it is a rare disease, and it almost always occurs in those who have, or who bear evidence of having had, lupus of the face. Dr. Radcliffe Crocker reports a case where the disease began in the gum of a strumous child, aged two years, with no lupus elsewhere, and Mr. Lennox Browne gives particulars of another case—"the exception which proves the rule." The patient who was under the observation of my friend, Dr. Orwin, was 21 years old. She had had lupus of the throat, which resulted in considerable destruction of tissue of gums, pharynx, and larynx, for six years, and it was only after the lapse of that time that her nose became affected with *lupus vulgaris*, the appearance of which served to confirm the diagnosis. The few cases of lupus of the parts under consideration which I have seen have been associated with lupus of the cheek or nose; but though the cases of true lupus seen by me have been few, I have had my attention directed to many cases of supposed lupus, which, from collateral evidence, and, subsequently, from the effects of specific treatment, were shown to be syphilitic lesions.

Lupus is most **commonly met** with in those of a scrofulous habit; it is said to be more common in females than in males, and is most frequently met with in early adult life. The lesion may be mistaken for true tubercular ulceration, or for tertiary syphilis, but more frequently syphilitic ulceration of the palate, fauces, pharynx, and larynx, is diagnosed as lupus.

When lupus occurs in this locality it may be as an extension of the disease from the face, implicating the lips, the gums, and the palate, in its progress; or it may appear on the palate, pharynx, or larynx, without any

such direct infection. The affected surface may appear uneven from the presence of small rounded deposits beneath the mucous membrane, it may be ulcerated, or there may be numerous cicatrices bearing evidence of former destruction of tissue. The **ulcers** may be superficial and irregular in shape, with an uneven surface, or they may have a punched-out, circular appearance, while the surface around the ulcerated parts is rough and irregular from the presence of the small, rounded nodules or tubercles. When the larynx is affected, the epiglottis and ary-epiglottic folds are most usually involved, and the appearances are very similar to those met with in the palate and pharynx, namely, either a nodular thickening of the parts affected, or ulcers having the character of those described.

It is a distinctly chronic condition, and is remarkably devoid of pain. In some cases there may be extensive ulceration present, or evidences of former widespread ulceration, without the patient having made any complaint of pain, or even of discomfort.

Pathology.—The true nature of this disease is the subject of debate amongst pathologists and dermatologists, some of whom, following Koch, who demonstrated the presence of bacilli, apparently identical with the bacillus of tubercle, consider lupus to be a chronic tubercular affection, and it is styled by Martz "attenuated tuberculosis"; while other eminent observers oppose such a theory. The presence of the bacilli is by no means constant, is thought by some to be accidental, and when found, they exist in very small numbers.

In the **diagnosis**, care is necessary to differentiate between lupus on the one hand, and syphilitic and tubercular lesions on the other. The leading distinguishing points are that lupus begins in early life and affects the

mucous membranes secondarily to the skin, is of a very chronic character, and is associated with anaemia of the mucous membrane, while the surface around the ulcer is roughened or finely nodular, and it never leads to necrosis of the bones. Unlike a true tubercular lesion, lupus is usually unaccompanied by pain, there is absence of emaciation from its presence, and healing may be observed at one part while it continues to spread at others.

Gummata usually occur in adult life though met with in children suffering from inherited syphilis, they are associated with acute inflammation, they break down rapidly, and the resulting ulcers spread quickly, leading to extensive destruction of the soft tissues, and, in many cases, to necrosis of the underlying bone.

Treatment.—In recommending treatment the condition of the general health must be considered, the patient placed amidst healthy surroundings, and his digestion attended to. Medicinally, cod-liver oil and iodine are, perhaps, the most generally useful in modifying the strumous diathesis; and, locally, the diseased tissue should be destroyed. This may be accomplished by the use of the galvano-cautery, but the scraping away of all lupus tissue with a sharp Volkmann's spoon, as is practised when the skin is affected, and the removal of the uvula, when that appendage is involved, checking the haemorrhage by pressure, and coating the raw surface afterwards with iodoform ointment, is perhaps the most satisfactory way of dealing with the disease where the palate is affected. As evidence of the thoroughness of the measures necessary, Hutchinson remarks in one of his post-graduate lectures that "in all cases of lupus the treatment was based upon faith, that was to say, the practitioner had only to make up his mind that plentiful

cauterisation would cure the disease and the disease would be cured."

Where the larynx is the seat of the disease, no local measure is satisfactory; but where stenosis, from contraction of the cicatrices is present, intubation or tracheotomy becomes necessary, and should be performed.

CHAPTER X.

DIPHTHERIA.

DIPHTHERIA is a specific disease which is both contagious and infectious, and which, though endemic in some localities, occurs usually in epidemic form. Its chief characteristics are general prostration associated with morbid changes in the blood and in various organs of the body, and an inflammation of the mucous surfaces, especially of the palate, tonsils, and fauces (occasionally the surface of a wound is attacked), which tends to the formation of a false membrane. Septicaemia, resulting from absorption of the products of suppuration beneath the false membrane, may occur at a later stage.

The **antiquity** of this disease is indicated by various records, and in the present day its prevalence is so general that in almost every country of the world it occupies a prominent place in the mortality lists. In this country, according to the returns of the Registrar-General, there has been a progressive increase in the rate of mortality from diphtheria during the past twenty years.

Causes.—The tendency during recent years has been to consider diphtheria as a disease resulting from the action of some minute organism, the exact nature of which has perhaps not yet been fully determined, though its existence appears to be closely connected with decaying animal matter,

and which is probably in most, if not in all, cases introduced from without. The organism known as the **Klebs-Loeffler bacillus** is recognised by bacteriologists as the active agent in the production of this disease. This microbe is about the same length as the *tubercle bacillus*, but it is considerably thicker, and its usual rod-like form is frequently varied by one or both ends being clubbed. The most suitable staining agent by which it may be prepared for microscopical examination, is an alkaline solution of methylene blue, as recommended by Loeffler, and the identity of the bacillus may be verified by cultures and by inoculation experiments. In addition to the determination of the nature and habits of the exciting cause, there are many conditions worthy of attention which may be classed as predisposing causes.

Age.—While diphtheria may attack persons of any age, 95 per cent. of fatal cases in England, according to Dr. Thursfield's statistics, occur under ten years of age, the largest proportion of these being between the ages of one and five years.

Cold and Damp.—Diphtheria, as has been said, is found in almost every country of the world, occurring thus under widely varying conditions of climate and temperature ; yet in studying its geographical distribution and its appearance with reference to the seasons, it will be found that its development and spread are favoured by cold and damp. Anything which promotes dampness of an habitation, be it a cold season, inclement weather, or a sub-soil favouring stagnation of water in the immediate neighbourhood, and inefficient or neglected drainage, predisposes to the occurrence of diphtheria.

Condition of the Mucous Membrane.—Healthy mucous membrane is able to resist injury to a varying extent in different individuals, and this power appears to increase,

or, in other words, the mucous membrane becomes less susceptible to irritation as age advances. This power is diminished by the presence of any inflammatory condition, catarrhal, or otherwise, and by erosion and ulceration of the mucous membrane. These facts may, in part, explain why children are so frequently the subjects of diphtheria, and why cold and damp, which tend to excite catarrhal affections of the upper air passages, may act as predisposing causes. Similarly chronic enlargement of the tonsils, a condition readily affected by atmospheric changes, renders the individual more prone to contract diphtheria during an epidemic.

Idiosyncrasy.—Diphtheria cannot, perhaps, be considered a hereditary disease in the ordinary meaning of the phrase. Yet numerous well-authenticated instances have been recorded where several, and, in some cases, all the members of certain families have fallen ready victims to this disease, being attacked during different epidemics and in different localities. In such instances there would appear to be some similarity of constitution predisposing to the reception and development of the specific contagium.

The specific poison of diphtheria may be **conveyed** in a variety of ways, of which direct contact by deposition of the diphtheritic exudation on a mucous surface or on a wound is one. This may occur during the examination of the fauces of a patient suffering from diphtheria or during the application of some local medicament, when the patient, while the mouth is widely opened, expels small portions of the false membrane during the act of coughing, which may alight on the lips or enter the mouth or nose of the nurse or doctor. Clearing an obstructed tracheal cannula by suction with the lips has been the means of conveying the disease to more than one surgeon, and the nipple of a mother may become

affected by suckling a child suffering from diphtheria. The contagion may, on the other hand, be carried by air-currents, it may be retained on the walls, wall-paper, furniture, etc., of a room which has been occupied by a patient suffering from diphtheria, and it may be carried by the clothing of those who have been exposed to the infection. It is also readily conveyed by articles of food and drink, milk forming a ready vehicle. In towns, contamination of the air in dwellings by defective plumber-work, and, in the country, pollution of the water supply by sewage, are frequently demonstrated as the means by which the poison has been conveyed to the individual.

There is considerable uncertainty concerning the **period of incubation** in diphtheria. Mackenzie relates two instances illustrating the marked difference in the time which may elapse between exposure to the contagion and the appearance of the disease. In one case a girl, 6 years of age, was found to be suffering from diphtheria, with abundance of false membrane, on the morning following the afternoon on which she was first exposed to the infection; and in the other, a lady of 18, the disease did not appear until fifteen days after exposure to contagion. However, the actual time which elapses between the entrance of the microbe into the system, and the appearance of the disease, is considered to be from two to five days, and when the period is longer, the germs in all probability have been lodged in the clothing, and have not gained entrance to the system till some time after exposure.

Pathology.—Diphtheria is a poison-disease. The bacteria are implanted on a mucous surface, where they lead to the production of a poison, which, if the mucous membrane is weakened, inflamed, or fissured, is readily absorbed, and, entering the lymphatic vessels, passes on to the lymphatic glands and thence into the general circula-

tion. The poison acts on the system generally, and also locally, leading to the formation of pseudo-membrane, which is caused by necrosis of the mucous membrane at the point of implantation of the micro-organisms. The false membrane, which is a tough elastic substance, usually yellowish or greyish-white in colour, though occasionally of a brownish tinge, consists, as seen under the microscope, of a network of fibrinous threads, in the meshes of which are found epithelial cells, leucocytes, pus cells, and numerous micrococci. On the surface of the membrane the various micro-organisms associated with putrefaction are found, while in the deeper layers the Klebs-Loeffler bacillus exists in a state of almost absolute purity. Secondary systemic poisoning may occur where the sloughing membrane becomes gangrenous and the resulting putrid matter is absorbed.

The **symptoms** of diphtheria, which vary from those of a slight sore throat to those of severe and even malignant blood-poisoning, are determined by the intensity of the systemic disturbance and of the local inflammation, the position and extent of the membranous exudation, and the presence or absence of complications. The presence of membranous exudation in the throat is the characteristic symptom, as it is an almost invariable phenomenon of diphtheria ; but occasionally mild cases occur in which it is absent, and in other instances, which occur but rarely, the patient dies before it is developed. According to the position of the exudation, diphtheria is classed as faucial, pharyngeal, nasal, laryngeal, etc., and it is termed "primary" or "secondary," according as it occurs as an idiopathic condition, or supervenes, as it occasionally does, upon some other disease, such as scarlet fever.

After exposure to the specific poison, the period of incubation, varying probably from two to five days,

follows, and during this time there may be absolutely no symptoms, though usually languor and chilliness are complained of. The completion of the term of incubation is indicated by an elevation of the temperature of the body, rising, it may be, within a few hours from 99° to 102° or 103° F., by a feeling of dryness in the throat, with uneasiness or slight pain on deglutition; by stiffness of the neck, chilliness, and disinclination for exertion; and when the patient is an adult, complaint is made of headache and pains in the dorsal and lumbar regions.

On **examination**, the fauces, tonsils, and pharynx bear evidence of being inflamed, but the redness and tumefaction differ in no way from that of an ordinary catarrhal faucitis. If, however, the appearance of the parts is carefully noted as the disease progresses, one or more whitish spots, somewhat resembling small collections of muco-pus, are seen to make their appearance where the mucous membrane is most deeply injected. They are never numerous, and frequently there is only one such spot. Each tends to increase in size—neighbouring spots coalesce—and as the extent and thickness of the patch increases it becomes opaque, clearly defined, firm, and tough. Such patches are most frequently found on the surface of one or both tonsils, from which they tend to spread to neighbouring structures. The appearance of this fibrinous exudation is usually followed by a lowering of the temperature, and the lymphatic glands at the angles of the jaw become swollen and tender. Occasionally advice is sought at this stage on account of the glandular swellings, the discomfort in the throat being so slight as to raise no suspicion of disease within the mouth.

When, as occasionally occurs, the inflammation of the affected mucous membrane is severe, and the submucous tissues deeply involved, the temperature may rise above

that recorded before the appearance of exudation. When this is the case, it is accompanied by a proportionate rise in the pulse-rate, or the usual ratio may be exceeded, and the pulse resemble that of shock—small, rapid, and irregular. As the inflammatory process subsides, the temperature falls and the pulse improves.

Where the case is of the *benign* type, the temperature rarely exceeds 103° and often does not approach that point, the glandular involvement is usually slight, and the exudation is limited to the surface of the enlarged inflamed tonsils ; or should it spread beyond their limits, it does so to a slight extent only, and usually towards the uvula and palate.

While the membrane is present, portions of it may be detached by coughing or during the act of deglutition. At a period varying from the third to the eighth day of the disease, the false membrane in mild cases exfoliates and the underlying mucous membrane rapidly recovers its normal appearance, that which has been destroyed is replaced, and the tonsils decrease in size.

In place, however, of the gradual subsidence of the symptoms described, or after an apparent cessation of the more acute symptoms, and while the exudation is becoming loosened and detached, the inflammation may again become acute and affect the parts involved more deeply than before, producing greater local irritation and more severe constitutional disturbance. A fresh impetus is given to the growth of the pseudo-membrane, which rapidly spreads over the fauces to the palate, and from the fauces it may spread to the pharynx, and from this upwards to the nose or downwards towards the larynx, or it may extend in both directions.

The false membrane in the throat becomes grey in colour and the tissues around less inflamed, and in some

cases pale and oedematous, and the breath has a fetid odour. The progress of the case is towards asthenia, the temperature falls to normal, or one or two degrees below, and the pulse is weak and irregular. Appetite fails, and occasionally the compulsory ingestion of food is followed by sickness and vomiting. The urine, the examination of which should never be omitted, will usually be found at this stage to be loaded with albumen.

When recovery takes place in such a case, it is usually by slow degrees, and the membrane may remain present in the fauces for from ten to fourteen days, by the end of which time it has usually been discharged.

When diphtheritic exudation forms within the nasal cavity, it usually, though not always, occurs as an extension from, and is thus secondary to its appearance in, the fauces and pharynx. This condition is recognised mainly by the character of the discharge from the nostrils, which is profuse, muco-purulent in character, and highly irritating. It rapidly causes excoriation of the margins of the nostrils and the upper lip, and on the raw surface so produced, diphtheritic membrane frequently forms. The nares become more or less completely obstructed, there is occasional epistaxis the result of inflammatory congestion or superficial ulceration of the lining membrane of the nose, and the breath is fetid.

This "**nasal diphtheria**" is always a serious complication, as from the readiness with which absorption takes place here, constitutional poisoning is rapid and severe.

If death occurs in a case where the exudation has been confined to the fauces, pharynx, and nares, it does so in the majority of cases as the result of exhaustion. No interference with respiration of any vital importance may have occurred, but progressive weakening of the heart's action is manifested. Death from this cause may be

gradual, or it may occur suddenly and unexpectedly during, it may be, some slight excitement or exertion, as in attempting to sit up in bed.

When diphtheritic membrane forms **within the larynx** a totally different set of symptoms result, and this laryngeal diphtheria constitutes true croup.

Exudation may appear primarily in the larynx, but in most cases it occurs as an extension of the disease downwards from the pharynx, and when this is the case, it almost always occurs within the first week of the disease.

The symptoms associated with invasion of the larynx are, in the first place, those of laryngeal irritation, the most marked being a harsh, sometimes hoarse, dry, cough. This is followed by changes in the voice, which becomes rough and husky, and in some cases it is reduced to a whisper. Difficulty in respiration is next observed, and this, which at first may be variable from the occurrence of laryngeal spasm, increases in degree, and becomes more persistent as the disease progresses, until it is constant, from the presence of abundant false membrane, along with oedema of the glottis. In the majority of such cases, the course of the disease is steadily from bad to worse, the voice becomes less audible, and breathing becomes more laboured. The difficulties of the inspiratory effort are indicated by the widely dilated nostrils, the facial expression of distress, the depressions above the sternum and the clavicles, the indrawing of the intercostal tissues and of the diaphragm, and by cyanosis, first observed in the lips.

The symptoms of laryngeal stenosis are so marked that those indicating constitutional poisoning become of secondary importance, but it must be borne in mind that, on account of this latter state, the child's strength is more rapidly exhausted. In the great majority of cases death

results from asphyxia, from narrowing of the air-way by exudation, and by oedema of the glottis. Exudation in some cases may extend from the larynx into the trachea, and even into the bronchi, and, occasionally, a more or less perfect cast of the larger bronchi may be detached and expelled, to the great, though in most cases but temporary, relief of the sufferer.

COMPLICATIONS AND SEQUELAE.

Albuminuria.—Attention was first drawn to the occurrence of albuminuria in connection with diphtheria by Dr. Willoughby Wade of Birmingham. It occurs at some period in the course of the disease in about half of all cases of diphtheria; it is rarely found before the third day, is most frequently detected between that day and the eighth, after which it is met with in a smaller proportion of cases. It cannot be looked upon as a diagnostic criterion between diphtheria and simple affections of the throat, since it is so frequently absent in diphtheria, and present in simple cases from other causes.

Its presence, in cases of diphtheria, would appear to indicate toxaemia, as it is most abundant where symptoms of constitutional poisoning are most marked, and it is frequently absent in those cases which are serious, chiefly, from interference with respiration.

Unlike the albuminuria associated with scarlet fever it is rarely accompanied by oedema, and, as has been already stated, it occurs early in the course of diphtheria, while in scarlet fever its appearance is late, and is symptomatic of nephritis.

Adenitis and Cellulitis.—Enlargement of the glands at the angle of the jaw occurs in almost every case of faucial diphtheria, yet the glands so affected rarely sup-

purate. Suppuration, however, may take place, in which case the process may be limited to the affected glands, or the inflammation may extend, producing a cellulitis of the neck, and rapidly leading to the formation of a large abscess.

Paralysis.—So frequently does paralysis follow diphtheria that the estimate given by Gowers of 25 per cent. of all cases is regarded by authorities as moderate. Paralysis seldom occurs before the second or third week of the disease, and may not appear till after the lapse of six or eight weeks. It follows the mildest cases (in many of which its appearance confirms an otherwise doubtful diagnosis) as well as the most severe, and the tendency to its occurrence increases with age, being most rare in infants. The soft palate is usually first affected, and, in the majority of cases, the paralysis is limited to this part. Speech then assumes a nasal character, and deglutition is so interfered with that fluids, especially if taken in quantity or hurriedly, regurgitate through the nose. The palate hangs loosely, and, when touched, it remains immobile, sensibility and reflex movements being alike abolished.

In some cases disturbance of vision occurs, the most common lesion being paresis of the ciliary muscles, resulting in defective accommodation. Strabismus, ptosis, etc., occur according to the muscles affected.

Paralysis of the muscles of the lower extremities follows next in frequency. It begins as disturbance of sensation, followed by feebleness and interference with locomotion, producing a staggering gait, and should it persist for any length of time, atrophy of the muscles may ensue.

When the muscles of the larynx are affected, which is of comparatively rare occurrence, variations in the voice result. Should the sensibility of the mucous membrane

of the larynx be lost, there is danger of portions of food entering the larynx unknown to the patient, with, it may be, a fatal result. Paralysis of the muscle of the heart may occur in any case, and it may vary from slight and transient paresis to sudden and fatal paralysis. It occurs most frequently when convalescence has begun, and it is usually preceded by paralysis of the palate and fauces, except in those cases where it appears at an early stage of the disease. Then its onset is sudden, producing sickness, dyspnoea, and precordial oppression, the pulse becomes weak and intermittent, and death may be alarmingly sudden or it may occur within a few hours. When slight, recovery may take place, but that form which occurs during convalescence is sudden in its appearance, and is usually rapidly fatal.

Diagnosis.—While a typical case of diphtheria is readily diagnosed, even by those who have had limited experience of the disease, the most experienced practitioner is occasionally in doubt in the early stage of the disease, and in mild cases. Though not agreeing with those who hold that every case which presents a white patch on the tonsils or faucial pillars is of the nature of diphtheria, the writer is convinced that cases are met with towards the beginning and again towards the end of an epidemic of such a mild character as to cause one to hesitate to classify them as cases of diphtheria. Whether this is due to the specific poison being less virulent than in a typical case, or whether the power of resistance on the part of the individual is sufficient to withstand the attack, is an open question. It is, nevertheless, through the agency of such mild cases that the disease becomes widely disseminated, as they are apt to be overlooked, and the patient permitted to mix freely with his playfellows. As bearing on this point, the following statement in a recent communication by Dr. Thursfield

is interesting, that "in his experience a larger proportion of cases of diphtheria go unnotified than in connection with any other disease"; and that in 1893, in four well-marked epidemics of diphtheria occurring in widely separated parts of the country, he found, on investigation, that there had been at least 135 cases, of which only 21 (15 per cent.) had been notified as diphtheria, and that the spread of the disease was distinctly traceable to personal infection through school-agency.

In the early stage, prior to the appearance of the false membrane, the injection of the fauces might readily pass for that accompanying simple catarrh. The one distinct sign of diphtheria is the pseudo-membrane, which, even in its most superficial form, is so intimately connected with the subjacent tissues, that, when it is removed, a raw surface is exposed. The exudation associated with follicular tonsillitis sometimes forms an element of doubt. Follicular tonsillitis, it may be repeated, is a totally distinct disease from diphtheria, but diphtheria may supervene on an attack of follicular tonsillitis, just as it may on other catarrhal inflammations of the fauces and pharynx.

The secretion in follicular tonsillitis oozes from one or more lacunal openings, is of a soft pultaceous character, lies loosely and quite superficially, is readily brushed off, and disappears spontaneously by the third or fourth day. The local inflammation accompanying it is usually acute, and the temperature runs high, much higher than occurs in primary diphtheria; but, along with this, constitutional disturbance is comparatively slight, and there is entire absence of symptoms denoting toxaemia.

The affection of the throat in connection with scarlet fever, especially in cases in which the eruption is slight or has been overlooked, is sometimes mistaken for diphtheria.

Where exudation is present in the early stage (in most cases excessive follicular secretion) the temperature is higher than in diphtheria, the tongue may show the characteristic features of scarlet fever, the mucous membrane of the fauces and palate is deeply injected, the redness being often of a punctate character, and if the skin be carefully examined some evidences of the rash may be detected. At a later stage the grey membrane on the tonsils is of the nature of a slough, the necrotic process is not limited to the mucous membrane, and on close inspection of the skin desquamation may be detected. The diagnosis may be verified by a microscopic examination of secretion removed from the fauces by means of a swab.

Scarlatina and Diphtheria may exist together in the same patient, and when this occurs the diphtheria is, as a rule, secondary to the scarlet fever; and it may appear similarly, though more rarely, in association with measles.

Prognosis is always grave, though it varies in different epidemics and at the different stages of an epidemic. The disease in the earlier cases may be mild, gradually becoming more virulent and more rapidly fatal as time goes on, and again becoming modified in type towards the end of an epidemic. It is impossible to arrive at even an approximately correct death rate in diphtheria, as many early and slight cases pass unnoticed, and therefore unnotified; but the average of all cases of genuine diphtheria is perhaps nearly fifty per cent., and in some epidemics, such as at Berlin in 1885, it proved fatal in 65·5 per cent.

Prognosis is always more favourable during the decline of an epidemic, in warm than in cold weather, and the older the patient the more hopeful the issue. The two chief dangers are obstruction to respiration and constitutional poisoning; and the earlier either of these becomes

prominent in a case the prognosis is less favourable, and where both are present, the case becomes most unfavourable, even though relief to respiration be obtained by operation. Extension to the nose is most unfavourable, this being usually quickly followed by profound toxaemia.

Diphtheritic paralysis is dangerous to life only in proportion to the degree of interference with the heart's action and with the muscles of respiration. Where limited to the soft palate its duration is comparatively short, and there is no danger to life ; and even where more extensive, recovery can in almost every case be reckoned upon, though the duration of the paralysis may vary from a few weeks to several months.

Treatment—Prophylactic.—During the prevalence of an epidemic of diphtheria, the health of children in the infected neighbourhood should be carefully watched, and nasal or faucial catarrh promptly treated. When one of a family is attacked, the patient should be placed in a well-ventilated, sparsely furnished room, and strictly isolated from other members of the family. If an insanitary condition of the house be suspected as a possible cause, the other children should be at once removed and kept under observation for a time, and if necessary, the solution of the perchloride of iron administered. The free use of antiseptics in the sick room is a necessary precautionary measure which should never be neglected.

Active Measures comprise internal and local treatment, and operative procedures. The aim in treatment should be to combat and eliminate the general poison, to limit and subdue the local inflammation and prevent putrefaction, to maintain the patient's strength, and to relieve respiration when suffocation is threatened.

Internal Remedies.—Of the innumerable medicinal preparations employed, none of which can, unfortunately, be

termed specifics, (*a*) iron alone or with chlorate of potash, (*b*) iodide of potassium, (*c*) bichloride of mercury, and (*d*) ammonia, are perhaps most generally employed, and in the order named as regards the favour in which they are held by the profession.

(*a*) **Iron** is chosen for its tonic and astringent properties, and so the Liquor ferri perchloridi, which contains a much larger proportion of free hydrochloric acid than the tincture, is the preparation to be preferred, and it should be administered as in the treatment of erysipelas, *in full doses frequently repeated.*

℞. Liq. ferri perchloridi, - - - - ℥vj.
Pot. chlorat., - - - - - - ℈ii.
Aq. chloroformi, - - - - ad ℥iv. ℳ.

Sig.—A teaspoonful a dose.

In each dose there are ten minims, and this may be given every half hour, every hour, or every two hours, according to the severity of the case ; and in a child over six years the quantity may be increased to fifteen or twenty minims at each administration. After the first twelve hours the dose may be repeated at longer intervals. It is better not to combine the iron with glycerine, unless the taste is strongly objected to, when glycerine may be added. The value of iron in erysipelas is universally recognised, and in diphtheria it is perhaps the most powerful known antidote to the poisonous action resulting from absorption of the products of the bacillus, as well as to the septicaemia, the result of putrefactive changes. There are difficulties attending its use, especially when dealing with young children, on account of the unpleasant acrid taste and smarting of the throat caused by its administration. These may in a measure be overcome by the addition of glycerine ; or if this is impossible, dilute hydrochloric acid

in similar doses may be substituted for the perchloride of iron.

(*b*) **Iodide of Potassium** is employed in the treatment of diphtheria, largely on the recommendation of Dr. W. F. Wade of Birmingham. It was chosen on account of its eliminating powers; "it positively eliminates lead," and its action in syphilis is presumed to be somewhat similar. Wade recommended it to be given in doses of from 2 to 4 grains, every two, three, or four hours, in conjunction with 5 to 10 grains of chlorate of potash, and along with large quantities of bland fluids. He says in his original article (*Lancet*, 1862), "I have known of no instance of a fatal termination, ... and no instance of serious symptoms, or of secondary paralysis supervening where this plan of treatment had been rigorously carried out. The difficulty, especially with children, is in ensuring a copious supply of fluid. It exercises a speedy and salutary influence upon the general symptoms of the disease, and the exudation often diminishes with extraordinary rapidity." Though many follow this line of treatment with satisfactory results, my individual experience does not coincide with the beneficial results described by Dr. Wade.

(*c*) **Bichloride of Mercury** is strongly recommended by Jacobi in America, and by Dr. C. R. Illingworth in this country, on the ground of its action as an alterative and a germicide.

It is recommended to be given in hourly doses of from $\frac{1}{60}$ to $\frac{1}{10}$ of a grain, or more, according to age.

℞.	Hydrarg. perchloridi, - - - -	gr. i.	
	Ammonii chloridi, - - - - - -	℥j.	
	Pot. chlorat., - - - - - - -	℈ii.	
	Aq. menth. pip., - - - -	ad ℥vj.	ℿ.

Sig.—A teaspoonful a dose.

Each dose in this mixture contains $\frac{1}{48}$ of a grain, and may be given in milk, or further diluted with water. The use of this salt of mercury must be carefully watched, as anaemia and prostration may quickly follow its administration in full doses.

(*d*) **Ammonia** has a strong advocate in Sir Benjamin Ward Richardson. It is a good antiseptic, and, as an alkaline solvent, it has the effect of holding the blood in the fluid state, and of preventing the deposition of fibrine in the cavities of the heart, which so often leads to a fatal issue. It is said that where it is employed, those changes in the nerves which result in paralysis occur less frequently. The mode of administration adopted by Richardson is to give it in boiled milk, in the proportion of 4 grains of the carbonate of ammonia to each half-pint. The milk is sweetened according to taste, and then gently warmed to the temperature of new milk, and this mixture of food and medicine may be taken by the patient frequently and very freely.

Brandy or **Whisky** may be given along with food to promote digestion, and, when the vital powers tend to fail, the sustaining and stimulating effects of alcohol are both necessary and most valuable.

Local Medication.—In former times, caustics in solid form or in solution were freely employed, and, recently, the galvano-cautery has been recommended, the only palpable result, perhaps, being aggravation of the local inflammation.

Local applications are made with a two-fold object—(*a*) to destroy the activity of the bacillus of diphtheria, and (*b*) to prevent suppurative changes. With these ends in view, various antiseptic and astringent substances have been employed. When the solution of the perchloride of iron is being given in frequently repeated doses, its astringent

action is brought to bear on the fauces and any false membrane present, during each act of deglutition.

When other medicinal agents are employed, the local application, by brush or swab, of *liquor ferri perchloridi* may be adopted; but such an application, though beneficial in many cases, is always irksome to young patients, and the struggle in resisting the frequent brushing is exhausting.

Carbolic acid preparations and solutions of perchloride of mercury are frequently employed, but the use of the former is somewhat dangerous, and the efficacy of the latter, in dealing with the bacillus of diphtheria, is very questionable.

Salicylic acid in solutions of strength of 1–1000 to 2–1000, or held in suspension by means of mucilage, and applied at frequent intervals, is much more efficacious, and may be freely used along with any of the internal remedies already referred to.

Solution of peroxide of hydrogen, of ten volume strength, has been long used as a local application by Sir B. W. Richardson, and though for a time its employment was peculiar to himself, it is now extensively used, especially by American surgeons. Richardson applies it by means of a glass pipette, about five inches in length, tapering to a fine point, and furnished at the other end with an india-rubber cap. When the tube is filled, the fluid may be discharged slowly over the affected surface, or it may be delivered with some force into the substance of the false membrane, according to the degree of pressure exerted on the rubber cap; or by fixing cotton wool around the point, a swab is made which can be kept saturated, while fresh fluid filters through it. It oxidises and destroys the false membrane, which is then readily discharged during a cough, and when the pultaceous mass

is removed the surface beneath in many cases remains healthy. He recommends that the solution be rendered slightly alkaline by the addition of a few drops of a freshly-made solution of hydrate of soda.

The method of its use in America was recently described by Dr. Williams of Boston. A ten volume solution, which is the ordinary commercial strength, is taken and evaporated to a third or a sixth of its bulk, which results, allowing for loss during evaporation, in a solution of twenty-five to fifty volumes strength. To render it a more active germicide, he adds a half per cent. of dilute hydrochloric or sulphuric acid, and applies the resulting acidulated solution by swab, spray, or syringe. He states that it destroys the bacillus within a few seconds, and it hastens the disappearance of the false membrane; and that in practice he has had excellent results from its use.

The use of spirit of turpentine diffused through the atmosphere of the sick-room by means of a bronchitis-kettle is followed in many cases by good results. In order to obtain the full benefit of the drug two teaspoonsful of the turpentine should be put into the kettle every hour for the first twenty-four hours, reducing the quantity gradually as the membrane begins to loosen.

Lactic acid and various digestive agents have been recommended from time to time as solvents of the membrane, but their efficacy is questionable. Quite recently Dr. Klebs of Karlsruhe has announced that he has obtained from "pure cultures of diphtheria bacilli on fluid media" an active principle which, from its power to destroy the bacillus of diphtheria, is likely to prove a cure for diphtheria. It is stated that the use of this "anti-diphtherin" is unattended with danger to the patient, but from the many serious complications following the use of Dr. Koch's "tuberculin," the character

and full effects of this fluid must be thoroughly understood before its adoption can be recommended.

Laryngeal Diphtheria.—Where there is any evidence of the larynx becoming affected, as shown by frequent dry cough, changes in voice, etc., the patient's bed should be placed under a tent-like erection, and the air within this enclosure kept at an equable temperature—between 65° and 70° F.—and moistened by steam generated in a "croup-kettle" or other suitable apparatus. Antiseptics may be added, but it must not be forgotten that the steam is the agent desired. Its inhalation is soothing, it relieves spasm and assists and hastens the removal of the exudation. In the early stage the inflammatory action may be modified by the application of ice over the larynx.

When there are indications of false membrane being present within the larynx, a sharp emetic should be administered, not as an antiphlogistic, but with the view of expelling portion of the membranous exudation during its action. For this purpose a mixture of common salt and mustard, always at hand, and which together form a saline and stimulant emetic, was recommended by Dr. Prosser James; but ipecacuanha wine with sulphate of zinc is easy of administration, fairly rapid in action, without having any serious depressant effects. When once the emetic has induced vomiting it is seldom advisable to repeat it, even though improvement may have followed the first administration, as repetition tends to exhaustion.

If in place of improvement in voice and relief to breathing from the use of inhalation of steam and emetics, breathing becomes more laboured, it is necessary to resort to intubation or tracheotomy to avert suffocation.

Intubation.—So far as I can gather, intubation in laryngeal diphtheria has not been a successful procedure in this country; personally, I have had very few recoveries

from its employment in cases of laryngeal diphtheria, and in several apparently suitable cases have had to perform tracheotomy at a later stage. Dr. O'Dwyer's set of instruments for intubation of the larynx consists of (1) a gag, (2) an introducer, (3) an extractor, (4) five tubes of varying sizes, each fitted with an obturator, (5) a scale for selecting the appropriate size of tube according to the age of patient, (6) a respirator for surgeon's use.

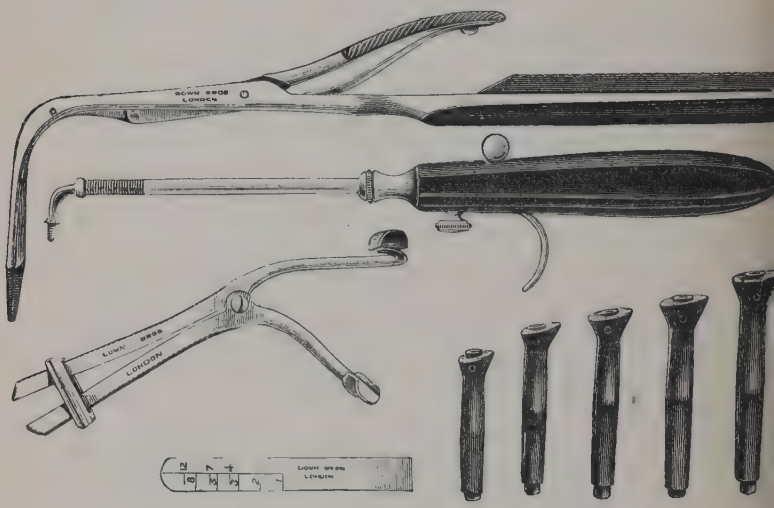


FIG. 29.—O'Dwyer's instruments for intubation of the larynx.

The tubes are made of metal; they vary from $1\frac{1}{2}$ inch to $2\frac{1}{2}$ inches in length, are elliptical in shape, thus exercising less pressure on the vocal cords than if cylindrical. The head is large, to prevent the whole tube passing through the glottis into the trachea, as occurred with the earlier forms, and there is a bulge in the middle of the tube which, together with its weight, prevents its easy ejection.

Introduction.—Having selected a tube in size suitable to the age of the patient, a thread is passed through the opening near the head, and a loop formed of about 18 inches. The obturator is then screwed upon the introducer and the tube attached. Thus prepared it lies at hand ready for use.

The child is placed on the nurse's knee, the hands and legs are fixed by the nurse, while the head rests against her left shoulder. When in this sitting posture the gag is introduced between the jaws on the left side and held there by an assistant from behind. The surgeon then takes up the introducer with tube, as prepared, catches the loop of thread over the little finger of the left hand, introduces the left forefinger into the mouth, and with it hooks up the epiglottis. The finger is closely followed by the tube fixed on the introducer, the end of the tube is guided into the larynx by the tip of the left forefinger, and as it is passed over the epiglottis the handle of the introducer is raised, by which means the tube is brought into the line of the larynx. When the tube has entered the larynx, it is detached by pushing the slide on the introducer forwards, the introducer with obturator attached is withdrawn, and the tube pressed home by the point of the left forefinger. If the tube has entered the larynx there is an interval of violent coughing, then respiration becomes quiet, and when such is the case the loop of thread is passed over the right ear till the coughing subsides, when the loop may be cut and the thread withdrawn. If, on the other hand, the tube has been passed into the oesophagus, there is no such disturbance—there is no coughing, breathing is not relieved, and the loop of thread gradually gets shorter as the tube descends towards the stomach. It is removed by making traction on the thread. As it is being pressed down into the larynx, the tube may get blocked by

false membrane being forced down in front of it, in which case the difficulty in respiration is increased and the tube must at once be removed, and re-applied after the obstructing mass has been cleared away. When the further use for the tube is unnecessary, the patient is placed in the same position as for introduction. The extractor, guided by the left index finger, is passed over the epiglottis and into the tube, the limbs of the extractor are opened by pressure on the lever, the tube is grasped firmly and readily withdrawn.

In administering food while the tube is *in situ* the child may be laid across the lap on his back, with the head thrown well back, or he may lie in the prone position with the head dependent. Food should be in fluid form, in small quantities, and it should be swallowed quickly.

Tracheotomy.—The early performance of tracheotomy gives a patient a much better chance of recovery than when it is resorted to only after the appearance of cyanosis, and should be performed as soon as it is shown that asphyxia cannot otherwise be averted. The case in which the most satisfactory result may be looked for is when symptoms of general infection are slight, when the implication of the larynx has been a late rather than an early feature, when the pulse is strong and regular and the patient over six years of age.

The Operation.—The patient wrapped in a warm blanket is placed on a table near a good light. Unless in extreme instances, where the patient, for instance, is becoming comatose or asphyxiated, chloroform should be administered and with great caution. When anaesthesia has been produced, the pillow should be removed from under the head and a wine-bottle, wrapped in a towel, placed behind the neck to render the larynx prominent ; or, and especially when dealing with very young children, the neck may be

fully extended by drawing the head well over the end of the table, so that the vertex is turned towards the floor, and by placing a sandbag at the upper edge of the table. The neck so exposed should be well sponged with an antiseptic lotion. The high operation is chosen as being more readily performed and freer from probable complications. The incision is made in the middle line from the upper edge of the cricoid cartilage downwards for fully one inch, and the tissues are carefully divided down to the trachea, the vessels encountered being as far as possible held aside by hooks. The isthmus of the thyroid occasionally gives trouble, and care must be taken when it is placed unusually high to avoid incising it. Bleeding, which is venous in character and sometimes profuse, should be arrested before the trachea is opened, though where suffocation is threatened, too much time should not be lost in attempting to secure every vessel, as, from the relief afforded to the right side of the heart, general venous oozing at once ceases when the trachea is opened, and a plentiful supply of air enters the chest. Before opening the trachea the rings should not only be felt with the forefinger, but they should be visible. A sharp hook is entered through the front of the cricoid, and this is held by an assistant at the head of the table to fix the trachea in the middle line and to draw it upwards and forwards. The knife is then inserted beneath the second or third ring, and these are divided from below upwards. The hissing noise of escaping air announces the opening of the windpipe, and care must be taken at this point *not* to remove the hook, as it should remain as a guide to the middle line of the trachea and to the position of the opening. The edges of the incision should be at once held apart by a dilator, or one edge may be grasped by catch-forceps, and through the opening mucus, blood, and possibly fragments

of membrane will be expelled. When respiration has become quiet, the cannula is introduced, and in all cases of laryngeal diphtheria the Foulis' cannula, though more difficult of introduction than some others on account of it being a rigid tube, will be found most satisfactory, as when in position it frets the parts less than a split cannula, and is more readily kept clean. The patient's head is then raised and laid on the table, the cannula is fixed with tape passing round the neck, the inner tube is introduced, and the patient placed in bed under a tent. The air within the tent must be kept uniformly warm and moist, a sponge wrung out of a hot antiseptic fluid, such as carbolic acid 1–40, may be placed loosely over the front of the neck, and the inner tube withdrawn, and cleared by passing a small bristle brush through it, at regular intervals, or when there is evidence of obstruction. When the operation is attempted on a patient *in extremis*, or should the patient become asphyxiated during the operation and even appear to be dead, *the operation should be completed in all cases.* I have on two occasions had a death on the table during the operation, where there was extensive exudation within the larynx and trachea, which could not be removed in time to restore respiration ; but I have also had several cases in which the child was comatose, so that no anaesthetic was necessary for the performance of the operation, and where by assiduous use of artificial respiration after the trachea was opened and cleared, consciousness was restored and life saved.

Though the operation is most simple on the dead subject, and is performed with comparative ease on the living, when there is no hindrance to respiration, there is often considerable difficulty experienced in a case of laryngeal diphtheria in a young child with a short fat neck, whose veins are deeply congested from threatened asphyxia, and

who is already in a state of exhaustion. Added to this is the freely mobile condition of the trachea, and the highly elastic nature of its walls.

Internal treatment and the regular administration of nourishment and stimulant must be continued as prior to the operation ; and should any difficulty be experienced in swallowing, a soft rubber catheter may be passed through the nose into the gullet, through which a supply of suitable nourishment may be given regularly.

When **recovery** follows, the tube is rarely required after the eighth day, though occasionally months may elapse before it can be dispensed with.

CHAPTER XI.

NEUROSES.

PARALYSIS of the **palate, fauces,** and **pharynx**, is seldom encountered, except as a sequela of diphtheria, when it is supposed to be due to impairment of Meckel's ganglion. It is occasionally met with as the only definite lesion in that disease, when its occurrence serves to demonstrate the diphtherial character of the case, in which symptoms referable to the throat may have been so slight as to pass unheeded, or, at most, to be considered of the most simple nature. The same paralytic condition may follow diphtheria of a wound with no symptoms referable to the throat, until changes in speech and difficulties in deglutition supervene from paralysis of the palate, fauces, and pharynx. Such a case was recently exhibited before the Glasgow Medico-Chirurgical Society by Dr. C. O. Hawthorne. A similar peripheral paralysis affecting the palate has been reported as a sequela of influenza. The palate hangs loosely, and, if the paralysis is complete, both voluntary and reflex movements are abolished, while tactile sensibility and the sense of temperature may remain unaltered or become impaired.

When these paralyses result from diphtheria, as the majority of them do, the prognosis is distinctly favourable, and treatment consists in a plentiful supply of suitable

nourishment, fresh air, and the administration of tonics, such as iron and strychnine. Exercise must be indulged in with great moderation while the paralysis persists.

The **nervous supply** of the **larynx** is derived from the pneumogastric, through two pairs of special branches, namely, the superior and the inferior, or recurrent, laryngeal nerves. The former supplies the mucous membrane generally, being thus the nerve of sensation, but it also contains some motor fibres. These latter are distributed (1) to the crico-thyroid muscle—the muscle which, when contracted, renders the vocal cords tense for the production of high notes; and (2) to the depressors of the epiglottis, namely, the thyro-epiglottic and the aryteno-epiglottic muscles.

The recurrent laryngeal nerves (right and left) are the motor nerves of the larynx, and they supply all the special muscles of this organ, except the crico-thyroid as already stated. Interference then with, or disease of, those nerves will result in loss of sensation, or impairment of motion, according to the branch affected.

Disease of the medulla oblongata, affections of the spinal accessory and of the trunk of the pneumogastric nerves, on either or both sides, result in impairment of the movements of the laryngeal muscles; but the impairment in all these cases is associated with other, and in all probability, more serious paralyses.

Here attention will be confined to those conditions which result from interference with the laryngeal nerves in their course, or to those affections where the laryngeal element is the prominent feature.

SENSORY PARALYSES.

Partial or complete **loss of sensation** over the mucous membrane of the larynx is a distinctly rare condition. In

the majority of cases it follows diphtheria, when it is usually associated with anaesthesia of the soft palate and pharyngeal wall, as already referred to. In other rare instances it is due to bulbar paralysis.

The **difficulty** experienced in **swallowing**, chiefly from the readiness with which fluid food enters the larynx during deglutition, is the principal symptom, and its importance depends largely on the degree of impairment of sensation.

On **examination** the parts may appear healthy, but with the use of a laryngeal probe under the guidance of the eye, the anaesthetic state of the mucous membrane is readily detected.

The history of a recent attack of diphtheria, impairment of the reflexes, paralysis of sensation or of motion in the palate, lower limbs, or elsewhere, and the absence of obstruction in the pharynx or oesophagus, materially help in the formation of a **diagnosis**. When it occurs as a sequela of diphtheria, recovery almost invariably takes place, and it usually does so within from three to six or eight weeks.

Treatment. The most important consideration in treatment is to secure to the patient a plentiful supply of nourishing food. When sensation over the laryngeal mucous membrane is completely lost, the fear of being choked aggravates the condition, and feeding at regular intervals by means of an oesophageal tube becomes a necessity. Medicinal treatment consists chiefly in the use of preparations of iron, strychnine, and arsenic; and electricity locally may be employed. A gentle Faradic current, with one pole over the neck, in the course of the superior laryngeal nerve, and the other (a laryngeal electrode) applied to various points over the paralysed area, is perhaps the most satisfactory method of dealing with this condition.

MUSCLES OF THE LARYNX.

Before entering upon a consideration of the **paralyses of motion**, it may be of advantage to enumerate the **special muscles** of the larynx which regulate the position and tension of the vocal cords. These are divided according to their action into adductors and abductors, and into tensors and relaxers.

The **adductor muscles** are—

1. The transverse *arytenoideus*, a single muscle which unites the posterior surfaces of the arytenoid cartilages, and by its contraction draws those cartilages together.

2. The external and internal *thyro-arytenoidei* muscles. Both sets are in pairs, and each is so attached to the outer sides of the arytenoid cartilages that, on contraction, they cause rotation of the vocal cords towards the middle line.

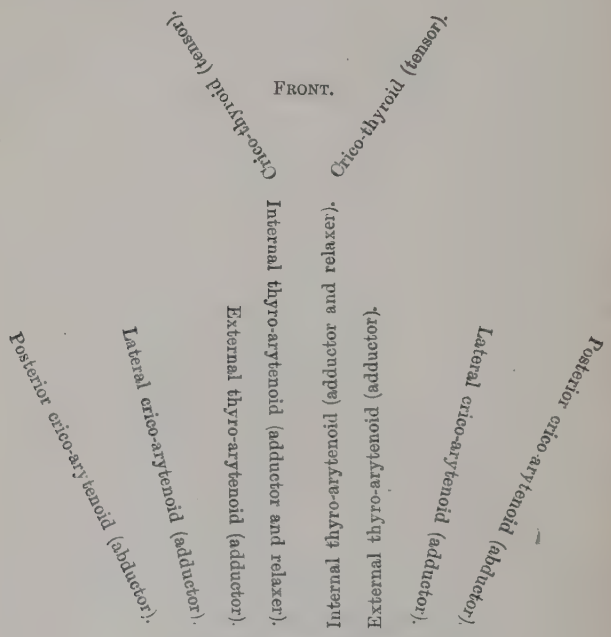
3. The lateral *crico-arytenoidei* muscles (one pair), each of which is attached to the outer angle of an arytenoid cartilage, and, on contraction, pulls this angle forwards, thus throwing the *processus vocalis* inwards.

The **abductors** consist of the two posterior *crico-arytenoidei* muscles, each of which, passing from the posterior surface of the cricoid cartilage to the outer angle of the arytenoid cartilage, pulls back the outer angle and causes the *processus vocalis* to rotate outwards.

The **relaxers** of the vocal cords are the internal *thyro-arytenoidei*. These, when acting alone, pull the thyroid cartilage upwards and backwards, and so lessen the distance between the thyroid and arytenoid cartilages, and render the vocal cords lax.

The chief **tensors** of the vocal cords are the crico-thyroid muscles, right and left. This pair of muscles, on contraction, produce rotation of the thyroid on the cricoid cartilage in a forward and downward direction, and by

this movement the distance between the arytenoid and thyroid cartilages is increased, resulting in heightened tension of the vocal cords.



The **adductors** form the stronger set of muscles, and being the muscles of **volition**, inefficiency in their movements is usually of a functional character.

The action of the **abductors** is of a **reflex** nature, and when their movements are impaired the cause is usually the result of some organic lesion.

All these muscles, with the single exception of the

crico-thyroid, receive their **nerve-supply** from the two recurrent laryngeal branches of the pneumogastric.

Though both the adductor and the abductor muscles have thus the same nerve-supply, the abductors appear to be more readily, and are, in fact, far more frequently paralysed than the adductors. This has been explained differently by those who have carefully investigated the subject, and the full explanation may be found in a combination of the various alleged causes. The adductor muscles of the body generally are more powerful than the abductors or extensors, and the insertion of the laryngeal adductors in particular gives them a distinct mechanical advantage over the abductors. In the nerves again the abductor fibres are supposed to be placed more superficially than the adductor fibres, and so comparatively slight pressure on the nerve will impair the action of the abductor muscles on the side compressed, while the adductors are in no way involved.

MOTOR PARALYSES.

Paralyses of Motion from disease or injury of the **superior laryngeal nerve.**—When the superior laryngeal nerve is implicated, sensation over the mucous membrane of the larynx above the level of the vocal cords is impaired or abolished; but there is in addition paralysis of the crico-thyroid muscles.

Symptoms.—Where paralysis of these muscles is complete—a very rare condition—the vocal cords remain flaccid during attempts at phonation, and any note emitted is necessarily of low pitch and hoarse in character. Where the condition is of the nature of a paresis, and both crico-thyroid muscles are partially paralysed, the result is perhaps equally significant. When vocalisation is attempted the sound emitted is clear, but remains so for a

very few seconds only. The voice starting say at C quickly descends in the scale, and the patient in trying to keep to the original note strains the muscles in front of the neck and depresses the chin. A patient (a man aged 28) so affected was under my observation for close on a year. On account of diminished sensibility, the fauces could be freely manipulated and the larynx readily and fully explored. When he attempted to produce a fairly high note he could do so, and the vocal cords were seen to be tense, but almost immediately a change occurred, and they became less and less tense until they visibly flapped ; and while the note was rapidly descending in the scale he involuntarily contracted the muscles in front of the neck and depressed the chin towards the sternum, but without apparently improving matters. Under galvanism, the use of iron and strychnine, and regulated vocal exercise, marked improvement resulted.

When the paralysis is bilateral it is perhaps always the result of diphtheria, and the tendency is towards recovery. When it is unilateral the cause may be found in some affection of the nerve on the paralysed side, or some diseased condition of the structures along its course which, by exerting pressure on the nerve, interferes with its function.

Treatment.—When of diphtheritic origin, the use of nerve tonics and the Faradic current are of distinct service in restoring the parts to their normal condition. When, on the other hand, the paralysis is due to some local lesion, treatment will depend on the nature of that lesion. If, for instance, there has been an inflammatory affection of the nerve or its sheath, a series of blisters applied along its course, and especially in the neighbourhood of the greater cornu of the hyoid bone, along with the internal use of iodide of potassium, may be adopted with benefit ; or when

the paralysis results from pressure, the removal of the cause by local applications, or by operation, may enable the nerve to become active again.

Paralysis of the Abductors.—The paralysis may affect one side only, or both sides may be involved. Cases of **unilateral** paralysis are not uncommon, while **bilateral** paralysis of the abductors is a rare condition.

Unilateral Paralysis.—The lesion giving rise to unilateral paralysis may be situated in the medulla, or it may be of the nature of some injury to, or pressure upon, the vagus in the neck. The majority of cases, however, result from pressure exerted upon the recurrent laryngeal nerve, and the more common of the conditions interfering with the function of the nerve are aneurism of the aorta or of the right subclavian or innominate arteries, condensation at the apex of the right lung, enlargement of bronchial glands, tumours of the mediastinum, malignant disease of the thyroid gland and of the oesophagus.

The most common **cause** is aneurism of the arch of the aorta, and the left abductors are most frequently paralysed. This is explained by the difference in the relations of the two recurrent nerves. The left branch is given off at a much lower level than is the right, and as the left leaves the trunk of the pneumogastric, it passes beneath and then immediately behind the aorta, and is in such close proximity to the artery that it is readily affected by any increase in the size of that vessel.

Symptoms.—When the abductor muscles are alone affected and the paralysis is unilateral, the subjective symptoms will be found to vary greatly in different cases. Quiet respiration may be unimpeded, but a certain amount of difficulty, amounting in some cases to stridor, may be experienced during exertion. The voice may be but slightly altered. In some no appreciable change can be

detected, but in many it is rough, and from the difference in tension of the two cords, the sound produced may be discordant in character.

The sound accompanying a cough is usually clear, or, if altered, the change is of the nature of huskiness. On laryngoscopic **examination** this condition is readily detected. The vocal cord on the paralysed side remains

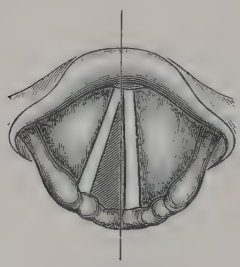


FIG. 30*a*.

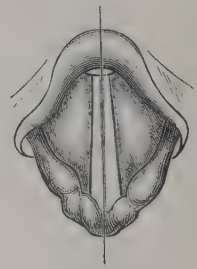


FIG. 30*b*.

Paralysis of the abductor muscles on the left side—
a Position of the parts during quiet respiration.
b The same during phonation.

fixed in the middle line. During phonation it occupies the same position as in health, both cords meet in the middle line and the note emitted is clear; but when a full inspiration is taken the paralysed cord is observed to remain unmoved, while the cord on the sound side moves quickly outwards—is rapidly and fully abducted.

In the earlier stages of abductor paralysis from pressure, the appearance of the larynx, under varying conditions, is interesting. For example, in the examination of the larynx in cases of suspected aneurism, I have found the larynx to be perfectly healthy in appearance, and abduction apparently complete and equal on the two sides; while in the same case, after some little exertion on the part of the patient, some difficulty in respiration was

exhibited, and, on examination, a relative deficiency in the outward movement of one of the cords during a deep inspiration was readily observed. And this has again disappeared as the effect of the exertion or excitement on the heart has subsided.

The paralysis, when due to pressure on the recurrent nerve, is not long confined to the abductor muscles. As has been stated, the recurrent nerve supplies the adductor muscles as well as the abductors, and as the pressure exerted by tumour, or other abnormality, increases, so the adductor fibres become involved, resulting in **complete paralysis** of the recurrent nerve.

On **examination** the paralysed cord is then found to occupy the cadaveric position, that is, it remains immovable midway between abduction and adduction; and as there is also paralysis of the internal tensor, the affected cord is flaccid and its free edge forms a curve with the concavity

FIG. 31*a*.

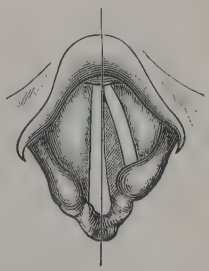


FIG. 31*b*.

Complete paralysis of the left recurrent nerve of some months' duration—
a Position of the parts during quiet respiration.
b The same during attempted phonation, showing the vocal cord on unaffected side crossing the middle line.

directed inwards. As the inter-arytenoid muscle derives its nerve supply from both recurrent nerves, the arytenoid cartilage on the paralysed side may be seen to move during both phonation and respiration.

As the paralysed cord occupies a position somewhat removed from the middle line, it seldom causes any interference with respiration, except during considerable exertion, but a change in the voice is invariable.

During attempts at vocalisation the unaffected cord comes up to, and in many cases goes beyond, the middle line in the hope of meeting its fellow, and in this way the chink of the glottis may become oblique, and the resulting note is at best husky.

It is in this complete recurrent paralysis that the ringing "brassy" cough, so frequently associated with aneurism of the arch of the aorta, is met with. During the forcible expiratory effort constituting a cough the glottis is not, as in the healthy larynx during a similar condition, firmly closed, and the paralysed cord is caused to vibrate during each explosion.

The **Prognosis** depends entirely on the cause, and if that can be removed, as in a rare case when pressure is due to syphilitic deposit, the function of the laryngeal muscles may be restored. **Treatment** likewise depends upon the cause. Iodide of potassium, with or without iron and strychnine, should be administered; and when pressure is the result of an aneurismal tumour, rigid rest in bed and the use of the iodides may prove useful.

The two following **cases** of paralysis of the abductors are of more than usual interest, one on account of the early age at which complete paralysis occurred, and the other as illustrating the value of the lesion as an early indication of deep-seated disease :—

The first **case** was seen by me in the Royal Hospital for Sick Children at the request of Dr. Finlayson, and it was published by him in the *Archives of Pediatrics* for September, 1893. The following quotation from that report

relating to the laryngeal lesion may be permitted on account of the rarity of the case :—

"On visiting the Children's Hospital on May 2nd I was astonished to hear a peculiar cough, such as I had never heard in a child. On inquiring who had the cough, a child of four and a half years was pointed out, and I found that the child had just been admitted that day. The cough resembled the most extreme form of hoarse cough met with in aneurysmal disease complicated with laryngeal paralysis. The first point was to ascertain whether there was any local disease in the larynx to account for the strange cough. Dr. Walker Downie was asked to examine the larynx next day, but no swelling, ulceration, or disease of the mucous membrane was present. There was, however, paralysis of the left vocal cord, as regards abduction, so that it remained fixed near the middle line, while the right moved freely. This cleared the way for the diagnosis. The symptoms and physical signs pointed to consolidation and softening from phthisical disease, in the left lung in particular ; and the absence of any tubercular disease in the larynx seemed to me to make it very certain that the case was one of the class referred to, where implication of the recurrent laryngeal nerve had been brought about by the pressure of glands, or the matting of pleuritic adhesion. The child was extremely rickety, and the family history was highly tubercular. The patient died after two weeks' residence in hospital, and a post-mortem examination was made by Dr. Joseph Coats, of which the following is the summary : —'Phthisis pulmonalis, caseating bronchial glands, involving the left recurrent nerve. Peritonitis (tubercular) with glueing of liver, stomach, and spleen' ; and the following paragraph from the full report is specially interesting :—'Tracing the left pneumogastric nerve, it becomes adherent to a much enlarged and caseating gland, but can be traced down without much apparent alteration of structure to the level of the root of the lung. The adhesion begins just above the off-giving of the recurrent nerve. This nerve is intimately connected with, and involved in, caseating glands, almost from its origin, so that it is with difficulty traced round the aorta : it appears to be spread out and its substance involved in the infiltration.'"

The second case was that of a ship's carpenter, aged 55, who became hoarse in April, 1892, and was sent to me by

Dr. George Marshall. Throughout his whole life he had enjoyed the best of health. I saw him early in May, when he complained of hoarseness, frequent cough, and shortness of breath on exertion. On laryngoscopic examination there was paresis of the abductor muscles on the left side, along with a general injection of the mucous membrane of the larynx. No intra-laryngeal cause could be detected, and, though he expressed himself as being perfectly well and strong, and simply annoyed by the condition complained of, pressure deep in the mediastinum was evident, and, though aneurism was suspected on general grounds, the exact nature of the lesion could not then be determined. His chest was carefully examined by his own medical adviser on several occasions with negative results. Rest in bed, the use of hot inhalations, and the administration of iodide of potassium, were prescribed. At the end of three months his voice is stated to have become clear, and is said to have remained so for fully nine months, when it again became husky, and speaking was performed at the expense of considerable effort. On examining the larynx, seventeen months after the first inspection, the left vocal cord was seen to occupy the cadaveric position and to be curved, with the concavity towards the middle line, indicating complete recurrent paralysis on the affected side. In order that the condition of his chest might be thoroughly investigated, he was transferred from the Throat department to one of the Medical wards, where he was placed under the care of Professor Gairdner and Dr. Hawthorne.

There was no doubt as to the presence of some intra-thoracic tumour, though there was doubt as to its precise nature and seat. Within a week or two, however, malignant disease, implicating the left lung, was diagnosed: the symptoms became more pronounced as the disease

advanced, and he died of exhaustion within three months from the date of his admission to hospital.

At the post-mortem examination the diagnosis was verified. The disease in all probability had its starting point in the bronchial glands, and in extending invaded the substance of the left lung and involved the left bronchus, the left auricle, and the pericardium extensively. The left pneumogastric nerve ran into the tumour, and the left recurrent branch could be traced from the lower border up towards the side of the trachea. The left pulmonary artery was much narrowed at its origin, and coursed throughout the whole breadth of the tumour on its way to the lung. The structure of the tumour was that of a small round-celled sarcoma (lympho-sarcoma).

I had no opportunity of examining him during the period in which his voice is said to have been clear, but the regaining of the voice is readily explained. Under treatment the congested state of the mucous membrane disappeared, and the affected cord remained in the position of complete abductor paralysis, that is, it lay close to the middle line, a condition which, while it may obstruct respiration, does not necessarily interfere with the voice. It remained in this position for several months, during which the voice remained clear; but as pressure on the nerve increased, the adductor fibres became implicated, and complete recurrent paralysis resulted, the affected cord assumed the cadaveric position, and the voice became husky.

Bilateral Paralysis of the Abductors.—As already stated, cases of bilateral paralysis of the abductor muscles are of rare occurrence. When it is met with, the lesion may be central, as in disease of the medulla, or it may be, and usually is, the result of pressure exerted on both pneumogastrics, or on the two recurrent laryngeal

branches. A double aneurism may be the cause, though more frequently malignant disease of the thyroid gland is the compressing agent; and among other possible causes may be mentioned cancer of the oesophagus, fibrous goitre, and enlargement of the bronchial glands.

Symptoms.—In the early stage of compression, when the **abductors alone** are involved, inspiratory dyspnoea is the chief symptom. The voice in most cases is unaffected, and when it is altered it is so to a slight extent only, and usually from some accidental condition. But the patient finds that he has an increasing difficulty in breathing, especially on exertion, and after a time this inspiratory dyspnoea becomes permanent. Sleep is much broken by the feeling of suffocation and by the stridulous character of the breathing.

In making a **laryngoscopic examination**, the careful avoidance of anything which would interfere with respiration, or which might excite the patient and induce spasm

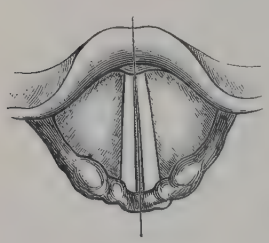


FIG. 32*a*.

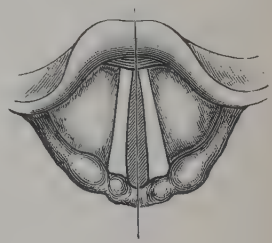


FIG. 32*b*.

Bilateral paralysis of the abductor muscles—
a Position of the parts during quiet respiration.
b The same during a forced expiration.

of the glottis, is necessary. When the mirror is in position, and the patient breathing quietly, both vocal cords are found to lie close together during inspiration, and to be slightly separated during expiration. Phonation is

readily performed, and the note produced is clear. This condition, unless relieved by operation, may prove fatal, possibly in a sudden fashion, from suffocation.

But as pressure on the nerve increases by increase in the size of the growth, **complete bilateral paralysis** of the recurrent nerve results when both abductor and adductor muscles are involved. There is then no dyspnoea while the patient is at rest, though there is a variable degree of difficulty in breathing during exertion. The voice, on the other hand, is wholly lost, and the patient either speaks in a quiet whisper, or the speech is rough and husky, without voice. Coughing is performed with difficulty, and is hoarse in character; and as the mucus cannot readily be dislodged, it remains adherent to the lining membrane of the larynx and its cavities, where it decomposes, and gives to the breath a fetid odour.

On laryngoscopic examination, when the paralysis has become complete, each vocal cord is found to occupy the cadaveric position, where it remains unmoved during both respiration and attempted phonation. Some time ago I examined a **case**, at the request of Prof. George Buchanan, of complete bilateral paralysis of the abductors in a woman aged 58, in which the cause was malignant disease of the thyroid. The whole gland seemed infiltrated, and the resulting mass was hard, irregular in outline, nodular over the surface, and firmly bound down to the tissues of the neck.

Prognosis, as in unilateral paralysis, is dependent on the cause, but on account of the liability to sudden spasm of the glottis from causes so slight as the lodgment of mucus and the like, it is more grave when the paralysis is bilateral.

Treatment.—Where, as in unilateral paralysis, pressure is the result of syphilis or of aneurism, the general treat-

ment must be similar to that recommended in unilateral paralysis from those causes, but, in addition, operative measures are frequently necessary to relieve respiration. Tracheotomy or intubation may be adopted. Where the pressure is due to aneurism, if the former operation be chosen, it must be performed with caution, and great care must be taken subsequently to prevent the cannula causing ulceration. Intubation is to be preferred in cases due to aneurism and in malignant cases, if the tube introduced can be borne. When the paralysis is the result of a cancerous or fibrous enlargement of the thyroid, the gland should be extirpated if possible.

Paralysis of Adductors.—As has just been stated, paralysis of the adductor muscles may be caused by deep pressure on the recurrent laryngeal nerve, in which case, whether one or both sides are implicated, it is secondary to paralysis of the abductors. Cases however of a totally different type occur, in which the muscles of adductors alone are involved. These are described as of hysterical origin, and the paralysis is always bilateral.

FIG. 33.—Paralysis of the adductor muscles. Position of the parts during attempted phonation, in hysterical or functional aphonia.

This form of paralysis is met with most frequently in females, and specially between the ages of fifteen and twenty-five years, and lack of occupation, unhappy sur-

roundings and physical exhaustion, are the more important of the predisposing causes.

The **distinguishing symptom** is aphonia, and it will be observed that in whispering there is no attempt to give voice to the words spoken, and there is an entire absence of huskiness. A patient with the will so perverted will probably, for months continuously, refuse to put forth the necessary effort to produce voice; but, while conversation is conducted in whispers, a cough or laugh, if suddenly provoked, will be found to have a vocal sound, proving the ability to close the glottis. Again, if a patient so affected be placed under the influence of chloroform, clear speech, and sometimes violent language, is made use of while going under the influence, and again while recovering from the effects, of the anaesthetic.

In **illustration** of the purely functional character of the aphonia in many cases, the following case, met with at the Throat Department of the Western Infirmary, may be cited:—The patient was 16 years of age and a pupil teacher, an occupation she much disliked. The date of an examination for which she had entered was approaching, and, being unprepared for it, she became aphonic, a condition which persisted for some weeks, and incapacitated her for her duties. The larynx was absolutely normal in appearance and in its movements, save that she made no effort to bring the vocal cords into line when requested to phonate. As improvement following Faradisation was of short duration, she obtained three months' leave of absence; and almost immediately on leaving the convent-school where she was being trained, she recovered her voice, and throughout the rest of her holiday was able to speak as formerly; but she again lost her voice on resuming work, and did not again use it until she was assured of a change of occupation.

Treatment.—When the patient is anaemic or suffering from physical exhaustion, tonic treatment, with change of air, scene, and occupation, should be recommended. In purely functional aphonia, the patient must be dealt with firmly and encouraged to exercise the vocal organ. Locally, stimulant applications, such as creosote and camphor, especially in the form of hot inhalations, are frequently of service; and when these are unsuccessful in bringing about recovery of the voice, Faradisation should be had recourse to. In doing so, one pole should be placed firmly over the back of the neck, where it is fixed by means of a strap, and the other applied along the course of the recurrent laryngeal nerve. Its application in this fashion is often followed by most satisfactory results. In more stubborn cases, resort may be had to the laryngeal electrode. One pole is again placed over the upper cervical vertebrae, and the other, terminating in a laryngeal electrode, introduced into the laryngeal cavity. With this the vocal cords may be stimulated alternately, and, by causing momentary contraction and closure of the glottis, the patient, in many cases, continues to use the voice in speaking without further applications.

Spasm of the Muscles of the Larynx.—From what has been said regarding the etiology of laryngeal paralysis, it will be readily understood how spasm of the laryngeal muscles may result from the presence of any condition which, by pressure, may irritate, without paralysing, the pneumogastric or recurrent laryngeal nerves. Spasm, elsewhere referred to, may be met with as a result of the entrance of some foreign body into the larynx; occasionally it is of hysterical origin, and it may occur in connection with epilepsy, and in general convulsions associated with other diseases.

Patients so affected are usually adults, but, on the whole,

such cases are comparatively rare. In children under two years of age, however, spasm of the larynx is of more frequent occurrence, and as a purely nervous disorder, exhibits a definite train of symptoms, and is described as **laryngismus stridulus.**

Any condition which increases reflex irritability acts as a **predisposing cause**, and notably, hydrocephalus and chronic cerebral affections, rickets, gastric disturbances, intestinal irritation, and dentition. Occasionally it may result from enlargement of the thymus gland, when it has been termed "Thymic Asthma," or from chronic thickening of the ventricular bands of the larynx.

An **attack** may come on suddenly and without warning, or it may be preceded by restlessness or carpo-pedal contractions. The **symptoms** are mainly those of suffocation. There is closure of the glottis from spasm of the adductor muscles, and there may also be spasm of the diaphragm and intercostal muscles, and inspiration is arrested. Marked lividity may result, or the child may become pale and limp, and the attack may be of short duration, or it may be so prolonged that death seems pending and in some cases may actually occur. As the spasm subsides, inspiration is resumed, and the first few efforts are accompanied by a shrill note somewhat similar to the "crow" in whooping-cough. There is no elevation of temperature in laryngismus stridulus, and this serves to distinguish it from those inflammatory disorders of the larynx in which spasm may be induced by the local inflammatory process.

Treatment.—Where an attack is threatened, it may be cut short by the administration of an emetic; and during a paroxysm, slapping the chest with a wet towel, immersion in a warm bath, or artificial respiration may be employed. Recourse might be had to the use of chloroform vapour. In cases where a tendency to this condition

has declared itself, if the general health is at fault, efforts must be made to improve it as far as is possible, by regulating the diet, assisting digestion, and attending to the state of the bowels. Warm baths followed by the cold douche, and sponging with cold sea-water, employed in the interval between the attacks, are frequently useful as preventive measures. The use of an anthelmintic is often of considerable service. In other cases, the regular use of bromide of potassium, with or without belladonna, will be found most useful in modifying the severity of the seizures, and in ultimately overcoming the tendency.

Stammering of the Vocal Cords.—Under this title, Dr. Prosser James first described a condition apparently due to a defect in the power of co-ordinating the intrinsic muscles of the larynx. The vocal apparatus fails at intervals to carry out properly the behest of the will, and this gives rise to sudden interruptions to vocalisation, resulting in a feeble, jerky voice, or it may be to a momentary voiceless condition, while the power of articulation remains unaffected. It may be met with in those whose general health has been reduced by some serious illness, and it is said to occur most frequently in clergymen. If careful investigation be made in those latter cases, it will be found that in the majority the condition is not so much an affection of the nervous supply, as the result of improper methods in the production of the voice, and that it is especially due to the error of continuing to speak after the lungs have ceased to contain a sufficiency of air to cause the necessary continuous vibration of the cords. The correction of this error is the essential point in treatment. In the former cases, general muscular exhaustion is probably the cause, and the aim in treatment then must be to improve, by every means, the state of the patient's health.

Spasmodic, Nervous, or Laryngeal Cough.—This, which is a peculiar, often intractable, cough, is occasionally met with, chiefly in children and young females. The cough is of a loud, hollow, barking, character. Sometimes deep in tone, it may be frequently repeated and aggravated when attention is called to it, is unaccompanied by expectoration, and causes the patient little or no pain. In the majority of cases, **no definite cause** can be discovered, and the result of an examination of the fauces, pharynx, larynx, and lungs being in most instances negative, it is presumed to be due to an increased reflex sensibility. Anaemia or atony of the fauces and elongation of the uvula may occasionally be the exciting cause. In some cases it appears to follow whooping-cough, in others it may be looked upon as a "habit," and not infrequently it is associated with symptoms indicative of hysteria. In some cases the "barking" cough is due to choreic movements of the faucial, pharyngeal, or laryngeal muscles. **Faucial and laryngeal chorea** may occur *per se*, or the muscles of those parts may be affected in common with the muscles of the body generally, or, as in one of three interesting cases of laryngeal chorea reported in the *Lancet*, vol. i., 1892, by Dr. J. H. Nicholl, the implication of the laryngeal muscles may precede, by a considerable interval of time, an attack of general chorea. Under favourable conditions, the jerky movements characteristic of chorea may be observed in the fauces and larynx.

Though intractable, it leads to no serious consequences. Where anything causing irritation can be detected, it should be removed, the patient's attention should be directed away from herself, out-door games should be indulged in, and the use of general tonics, and, possibly, anti-spasmodics may be necessary. In a good many instances syrup of chloral acts beneficially.

CHAPTER XII.

MATERIA MEDICA AND THERAPEUTICS.

Throughout the preceding chapters the necessity for **constitutional treatment** in all disorders the result of systemic disease has been insisted on, and the requisite details are to be found in works on Medicine and Surgery. Attention will here be confined to those **topical measures** which experience has shown to be most useful in combating the various abnormal conditions already described. These may be described under the headings of Gargles, Lozenges, Inhalations, and Pigments.

I. **Gargles.**—Certain solutions and infusions in the form of gargles have long been used in the treatment of faucial and pharyngeal affections; but their beneficial effect, as commonly employed, is extremely doubtful, except in those cases where the parts to which the remedy is sought to be applied lie in front of the tonsils. Von Troltsch has, indeed, described a method known as pharyngeal gargling, in which the patient, having taken a mouthful of the fluid, throws back the head, and performing the act of deglutition in an incomplete fashion, allows the liquid to pass a certain way towards the gullet, without, however, swallowing it. By this means the muscles of the fauces and pharynx are caused to contract, and the pharyngeal mucous membrane is bathed in the liquid; though it may

be stated that a good deal of practice is necessary before this manoeuvre can be efficiently performed.

In the act of gargling, the patient should be directed to use a tablespoonful, and to repeat it three times on each occasion, thus employing close on two fluid ounces. In all acute inflammatory affections gargling should be discouraged, not only on account of the pain induced, but because positive harm may result.

Gargles are divided into antiseptic, astringent, sedative, and stimulating; and a combination of these properties may be found to be advantageous in certain cases. They are of service as *mouth-washes* under various conditions, and as *gargles* in certain chronic affections of the fauces.

The following formulae, which are somewhat similar to those given in the Throat Hospital Pharmacopoeia, are so proportioned that one ounce of the gargle, diluted with an equal quantity of water, gives the amount necessary for use on each occasion. This permits of the gargle being warmed, when required, by the addition of hot water. Other ingredients may be added when a combined action is desired, and the solution may be made stronger or weaker according to circumstances:—

A. Antiseptic.
Carbolic acid, 3 grains.
Glycerine, 30 minims.
Water to 1 ounce.

Antiseptic, stimulating and slightly sedative.

B. Astringent.
Alum, 10 grains.
Tannin, 20 grains.
Water to 1 ounce.

C. Stimulating.
Dilute hydrochloric acid, 18 minims.
Glycerine, 40 minims.
Water to 1 ounce.

Useful in foul or chronic sores in mouth and fauces.

D. **Sedative and slightly anaesthetic.**

Bromide of potass, 15 grains.
Hydrochlorate of cocaine, 1 grain.
Water, 1 ounce.

When a stronger anaesthetic action is required, the carbolic acid gargle may be adopted, with the addition of one or two grains of cocaine, and used cautiously.

II. **Lozenges.**—Lozenges may be used as a means of introducing drugs which act either topically or constitutionally, or which combine both of these functions. Examples of the latter are to be found in guaiac, aconite, and morphia lozenges. In throat affections they are chiefly used as local remedies, and the employment of medicaments so prepared has the advantage over their administration in solution, in that the local action may be rendered well nigh continuous, the patient for this purpose allowing the lozenge to dissolve slowly in the mouth, without mastication. The chief excipients employed in the manufacture of lozenges are sugar, gum acacia or gum tragacanth, fruit paste, glycerine, gelatine, and liquorice, of which the first two are those mainly ordered in the British Pharmacopoeia, the resulting lozenge being so hard as to cause considerable discomfort when the parts are tender, and sometimes actual irritation or erosion of the mucous membrane of the mouth. To avoid this, fruit pastes were introduced, and in many cases they answer admirably, though their use occasionally leads to gastric derangement, especially in children suffering from any febrile disturbance. Under these circumstances liquorice or gelatine will be found to be more suitable. Medicated throat pastilles are of this nature, being rendered soft and demulcent by a basis of Pâté de Jujube, while their rounded form causes the minimum amount of irritation.

The best known of the lozenges of the Throat Hospital Pharmacopoeia are *guaiacum* (Trochisci Guaiaci), each of which contains two grains of the resin, and is stimulating, slightly astringent, and possessing a special influence over tonsillar inflammations; *Cubebs* (T. Cubebae), half a grain in each, stimulating, astringent, and useful in catarrhal states; *Rhatany* (T. Krameriae), 3 grains in each, astringent; *Marsh-Mallow* (T. Althaeae), one grain in each, emollient, and useful after abscission of tonsils or uvula.

Of medicated pastilles the following may be noted:—*Aconite*, half a minim of the B.P. tincture in each; *Chlorate of Potash*, one grain in each; *Compound Rhatany*, two grains of the extract, and $\frac{1}{10}$ grain of hydrochlorate of cocaine in each; and *Menthol* with *Cocaine*, $\frac{1}{20}$ grain of each.

When lozenges are distasteful, and also in the case of children, a similar continuous local action may be obtained in a pleasant fashion by mixing the drug with powdered sugar, *e.g.*,

> Chlorate of potass, one drachm.
> Biborate of soda, one drachm.
> Finely powdered sugar, two drachms.

Of this mixture as much as will lie on a sixpence may be placed on the tongue, and repeated at frequent intervals.

III. **Inhalations.**—These are divided, according to the method of their application, into moist, dry, atomised, and fuming inhalations.

a. **Moist Inhalations.**—Steam has been referred to as a useful inhalation in diphtheria, and it forms the vehicle in all moist inhalations. These have been sub-divided into hot and cold, according to the temperature of the water employed, and this in turn is determined by the readiness with which the drug used becomes volatilised. The simplest manufactured apparatus for use in this manner is Maw's Inhaler; but in many cases a quart jug of nearly

equal calibre throughout answers just as well, and it has this advantage, that the patient may inhale the medicated vapour through both nose and mouth, whereas in the former, while the mouth is applied to the orifice of the inhaler, breathing may be, and often is, conducted by the nose alone—an error against which patients should be warned. A moist inhalation should only be employed for from three to five minutes on each occasion, and the patient should not be allowed to go out of doors for at least two hours after its use.

In the following illustrative formulae the proportions are those necessary to make one ounce of fluid, of which a teaspoonful is added to one pint of water, varying in temperature from 100° to 180° F. for each inhalation. When essential oils are prescribed, half a grain to a grain of light carbonate of magnesia to each minim of oil is used to hold it in suspension, and render it miscible with water, of which the following may be taken as examples :—

Stimulant. Oil of cassia, 8 minims.
Light carb. of magnesia, 4 grains.
Water to 1 ounce.

Sedative. Oil of hops, 6 minims.
Light carb. of magnesia, 6 grains.
Water to 1 ounce.

Carbolic acid, creosote, ammonia, camphor, oil of peppermint, pine oil, etc., may be similarly employed as antiseptics and stimulants ; and compound tincture of benzoin, chloroform, conium, hydrocyanic acid, etc., as sedatives.

b. **Dry Inhalations.**—These are made use of after the method introduced by Dr. Coghill of Ventnor, the apparatus required being an oro-nasal respirator containing some absorbent material which is impregnated with certain volatile substances through which the whole of the inspired air passes on its way to the lungs.

This method is chosen in cases such as pulmonary phthisis, etc., in which the employment of moist inhalations is contra-indicated. The drugs used are similar to those already mentioned, comprising creosote, carbolic acid, iodine, thymol, eucalyptus, and many other essential oils, dissolved in rectified spirit, and employed separately or in combination, according to circumstances.

c. **Atomised Inhalations.**—In this form the drug used is introduced in a finely divided state by means of spray produced in a steam or hand-ball atomiser, of which there are many kinds on the market.

It is mainly resorted to for the application of non-volatile substances, such as lactic acid, permanganate of potash, salts of iron, copper, zinc, etc.; and of oily preparations, such as olive oil, and liquid vaseline, alone or with some active agent in solution.

d. **Fuming Inhalations.**—These primarily consist of the inhalation of smoke produced by the ignition of **nitrated paper,** and have long been resorted to in the treatment of spasmodic affections of the respiratory tract, *e.g.*, asthma. The material is prepared by soaking unsized paper, such as white blotting-paper, in a watery solution of nitrate of potash, of a strength varying from 30 to 60 grains to an ounce. After being dried it is cut into strips, when it is ready for use, or it may be further medicated by the addition of such volatile drugs as camphor, tincture of benzoin, oil of sandal-wood, etc. When ignited, the paper should be placed in a jar, and the smoke inhaled.

Powders, of which stramonium is the chief, are also prepared with nitrate of potash, the smoke from which is inhaled after ignition.

The vapour of **chloride of ammonium,** now extensively employed in the treatment of catarrhal states of the naso-pharynx, may be described as a fuming inhalation. The

apparatus by which it is generated consists of three chambers for hydrochloric acid, liquid ammonia, and water respectively. These are so connected that, while being used, the fumes from the first two meet in the third, and combine to form chloride of ammonium, which, after being purified by passing through the water contained in the third chamber, is inhaled. This nascent vapour may be used by itself, or may be made the vehicle for the inhalation of other volatile drugs.

Pigments.—A large variety of substances in solution are employed for purposes of topical application, chief amongst which are the glycerines of the B.P., and watery solutions of the mineral astringents. These latter, in weak solutions, are employed as stimulants to indolent sores, and in stronger solutions as astringents. Nitrate of silver, in addition to being an astringent, acts as a protective agent from the formation of a thin layer of albuminate of silver over the surface to which it has been applied. The following are the more important substances, with the quantities per ounce usually employed :—Sulphate of copper, 10 to 20 grs. ; alum, 60 grs. ; perchloride of iron, 30 to 120 grs. ; sulphate of iron, 60 grs. ; nitrate of silver, 10 to 60 grs. ; chloride of zinc, 15 grs. ; chromic acid, 1 part to 2 parts of water. In addition to these, liniment of iodine ; menthol, 20 per cent. in olive oil ; camphor-chloral, camphor-thymol, made by rubbing together equal parts of the two ingredients, form useful topical aids to treatment.

Pigments may be applied by means of a hair-pencil, but a pledget of absorbent cotton wool, twisted round a probe or cotton-holder, is to be preferred, and, being freshly made for each application, is free from all risk of conveying infective material.

For purposes of producing anaesthesia of the fauces,

pharynx, or larynx, to permit of a satisfactory examination where the parts are unduly irritable, or preparatory to the adoption of some operative measures, hydrochlorate of cocaine in solution is now extensively employed. The strength of the solution should be from ten to twenty *per cent.* in water, and it is advantageous to add one *per cent.* of pure carbolic acid. The solution may be sprayed over the whole surface, or the action of the anaesthetic may be limited by rubbing it over the part to be rendered insensitive.

Caustics.—For the purpose of destroying portions of hypertrophied or redundant tissue, the **electric** cautery and certain **chemical** caustics are used. For the former a supply of electricity may be obtained from primary batteries or from accumulators charged by a dynamo; and these latter, if carefully and efficiently charged, are the more convenient. The cautery points consist of portions of platinum wire, soldered to two insulated copper wires. The platinum portions are variously shaped, according to the object aimed at in their use—sharp-edged for cutting, pointed for puncturing, and flat or in the form of a coil for destroying a larger surface. When about to be used, the point chosen is fixed to a handle furnished with a knob, pressure on which, when the apparatus is connected with the battery, completes the circuit, and the platinum wire becomes hot.

Of chemical caustics, chromic acid and trichlor-acetic acid are the chief. In the application of each great care must be taken to limit its action; and in the use of the latter it is well to anaesthetise the part with cocaine, previous to its application.

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